APPENDIX W: Revised Tier 1 Biological Opinion and Amendments

Tier 2 Environmental Impact Statement

I-69 Section 6

Martinsville to Indianapolis

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United States Department of the Interior

Fish and Wildlife Service

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24 August 2006

Robert F. Tally, Jr.
Division Administrator, Indiana Division
U.S. Department of Transportation
Federal Highway Administration
575 North Pennsylvania Street, Room 254
Indianapolis, IN 46204

Dear Mr. Tally:

The enclosed document transmits the U.S. Fish and Wildlife Service's (Service) Revised Programmatic Biological Opinion (BO) regarding the proposed construction, operation, and maintenance of Alternative 3C of Interstate 69 (I-69) from Indianapolis to Evansville, Indiana and its effects on the Federally endangered Indiana bat (*Myotis sodalis*) and the Federally threatened bald eagle (*Haliaeetus leucocephalus*). The original non-jeopardy BO for this project was issued on 3 December 2003. Formal consultation was reinitiated with the Federal Highway Administration (FHWA) for this project so that new information regarding additional impacts to Indiana bat maternity colonies and hibernacula could be appropriately analyzed and to ensure that this project was still in compliance with section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). Based upon our analysis of the new and previously existing information, we again concluded that this project is still not likely to jeopardize the continued existence of the Indiana bat nor will it adversely modify any Critical Habitat. Formal consultation was not reinitiated for the bald eagle and our previous non-jeopardy conclusion for the bald eagle still stands. The Revised Programmatic BO and Incidental Take Statement (ITS) (dated 24 August 2006) replaces and supersedes the original programmatic BO for this project (dated 3 December 2003).

Analyses summarized within the Revised Programmatic BO were primarily based on information provided within 1) the Tier 1 Biological Assessment Addendum [dated March 7, 2006; submitted by FHWA, prepared by Bernardin, Lochmueller and Associates, Inc.(BLA)], 2) I-69 NEPA documents, 3) scientific literature, 4) unpublished survey reports of Indiana bat and bald eagle research conducted in the action area (and elsewhere) during Tier 2, and 5) many meetings, phone calls, and written correspondence with FHWA, INDOT, and their consultants. Limited field investigations were also conducted by Service personnel from the Bloomington, Indiana Field Office (BFO). This Revised Programmatic BO considers the broad impacts of the entire action (50 CFR §402.14(k)) and was prepared in accordance with section 7 of the ESA.

To ensure that the impacts of take associated with the final alignments chosen for each of the six forthcoming Tier 2 Project Sections of I-69 are appropriately minimized and that the exemption of incidental take is appropriately tracked and documented, the FHWA and the Service will implement an appended programmatic consultation approach for this project. Under this approach, the Service's Revised Programmatic BO and ITS for I-69 have considered and quantified reasonable amounts of anticipated incidental take for Indiana bats and bald eagles for the entire I-69 project from Evansville to Indianapolis. All impacts associated with a Tier 2 Project Section will be analyzed in a Tier 2 Biological Assessment and individually reviewed by the Service to determine if the effects are consistent with those analyzed in the Revised Programmatic BO and addressed by the ITS's reasonable and prudent measures and associated terms and conditions. This approach will ensure that once specific alignments are identified, that the site-specific impacts of the resulting incidental take are minimized. If an individual Tier 2 Project Section is found to be consistent with the programmatic consultation it will be appended to the Revised Programmatic BO and ITS, along with any project section-specific reasonable and prudent measures and terms and conditions that the Service believes are needed to fulfill the requirements of section 7(a)(2). More details on how specific impacts associated with each Tier 2 Project Section are to be reported and documented are included in the enclosed ITS.

If you have any questions about the revised BO or ITS or how subsequent Tier 2 consultations should proceed, please contact Andy King at 812-334-4261, extension 216.

Sincerely yours,

Scott E. Pruitt
Field Supervisor

cc: Tony DeSimone, FHWA-Indiana Division
Janice Osadczuk, FHWA-Indiana Division
Tom Seeman, INDOT
Ben Lawrence, INDOT
Michelle Hilary, INDOT
Kent Ahrenholtz, BLA
Tom Cervone, BLA
Catherine Gremillion-Smith, IDNR
Bill Malley, Akin Gump
Jennifer Szymanski, USFWS
T.J. Miller, USFWS

enclosure

<u>REVISED PROGRAMMATIC BIOLOGICAL OPINION</u>

on the

PROPOSED CONSTRUCTION, OPERATION, AND MAINTENANCE OF ALTERNATIVE 3C OF INTERSTATE 69 (I-69) FROM EVANSVILLE TO INDIANAPOLIS

FOR THE FEDERALLY ENDANGERED INDIANA BAT (*Myotis sodalis*) AND THE FEDERALLY THREATENED BALD EAGLE (*Haliaeetus leucocephalus*)

traversing portions of

GIBSON, WARRICK, PIKE, DAVIESS, GREENE, MONROE, MORGAN, JOHNSON, AND MARION COUNTIES, INDIANA

Submitted to the Federal Highway Administration

August 24, 2006

Prepared by:
R. Andrew King
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EXECUTIVE SUMMARY

This document is a partial revision to the original programmatic Biological Opinion (BO) dated December 3, 2003 for the proposed extension of I-69 from Evansville to Indianapolis Indiana. Following the recommendation of the U.S. Fish and Wildlife Service (Service), the Federal Highway Administration (FHWA) reinitiated formal consultation on Tier 1 of the proposed I-69 extension on March 7, 2006 and submitted an addendum to the original Biological Assessment that detailed significant new information regarding potential impacts to the Federally endangered Indiana bat (*Myotis sodalis*) that were not known or available for analysis during the original formal consultation period in 2003. Because there was not any significant new information regarding the Federally threatened bald eagle (*Haliaeetus leucocephalus*), the Service did not deem it necessary and the FHWA did not request to reinitiate formal consultation on this species. Although this revised BO only contains substantive revisions involving impacts to the Indiana bat, we have incorporated the original analysis and sections pertaining to the bald eagle for continuity and clarity. As requested in the FHWA's March 7, 2006 reinitiation letter, the Service now confirms our previous concurrence with the determination that the I-69 project is *not likely to adversely affect* the eastern fanshell mussel (*Cyprogenia stegaria*) and the project is still *likely to adversely affect, but not jeopardize*, the bald eagle.

Even though the proposed extension of I-69 from Evansville to Indianapolis will have greater impacts to Indiana bats than were originally considered, based on our current analysis of the updated information, the Service still concludes that this project is not likely to jeopardize the continued existence of the Indiana bat and is not likely to adversely modify the bat's designated Critical Habitat. A revised Incidental Take Statement has been included at the end of the BO with its non-discretionary Reasonable and Prudent Measures and associated Terms and Conditions to further minimize the incidental take of both Indiana bats and bald eagles.

Lastly, we concur with FHWA's determination (as stated in its letter dated 20 July 2006) that the proposed I-69 project is *not likely to adversely affect* Cave in Greene County, Indiana, which is designated Critical Habitat for the Indiana bat under the Endangered Species Act.

When Cave was designated as Critical Habitat for the Indiana bat on September 24, 1976, the federal rule did not identify constituent elements associated with the conservation value of this particular cave, nor did it for any of the other caves or mines that were designated at that time. Therefore, we have had to identify the physical and biological features that make Cave essential to the conservation of Indiana bats ourselves. We believe the essential features include the cave's physical structure, configuration, and all openings that create and regulate suitable microclimates for hibernating bats within, its associated karst hydrology and cave stream recharge area/watershed, and the amount and condition of surrounding forested habitat (extending 5 miles from the cave's entrances) that is used by the bats during the pre-hibernation swarming period each fall. Because the Proposed Action for I-69 1) will not have any direct impacts on cave itself or its important conservation features identified above, 2) indirect impacts to the surrounding forest habitat are likely to be relatively far removed from the cave's main entrance and insignificant in size (24 acres of forest impacts/32,353 acres of surrounding forest = a 0.07% loss), and 3) it is extremely unlikely (i.e., discountable) that I-69 would cause an increased risk of someone physically altering or vandalizing the cave itself in some way, the Service, by way of this BO, has concurred with the FHWA's "not likely to adversely affect" determination. While our concurrence technically concludes the need for further informal consultation on Cave as Critical Habitat for I-69, we respectfully request that FHWA and INDOT continue to investigate any and all potential effects of the Proposed Action that we have yet to envision and thoroughly explore and include such additional analysis within the Tier 2 BA for Section 4.

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service or USFWS) biological opinion, which was primarily based on our review of two documents, the Tier 1 Biological Assessment for Threatened and Endangered Species, Interstate 69, Indianapolis to Evansville (dated July 18, 2003, revised October 27, 2003) (hereafter referred to as the Tier 1 BA or BA), and the Tier 1 Biological Assessment Addendum (dated March 7, 2006) (hereafter referred to as the Tier 1 BA Addendum, BAA, or Addendum). The Tier 1 BA was originally submitted by the Federal Highway Administration (FHWA) and was received at the Service's Bloomington, Indiana Field Office (BFO) on July 21, 2003 along with a letter requesting us to initiate formal consultation on the proposed construction, operation, and maintenance of Alternative 3C of Interstate 69 (I-69) from Indianapolis to Evansville, Indiana and its effects on the Federally endangered Indiana bat and the Federally threatened bald eagle. The original formal consultation for Tier 1 of I-69 was concluded with the issuance of the Service's programmatic Bioloical Opinion on December 3, 2003. On March 7, 2006, the FHWA requested to reinitiate formal consultation for the Indiana bat and submitting a Tier 1 BA Addendum that detailed additional impacts to Indiana bats stemming from significant new information regarding this species' presence and abundance within the project's action areas, as revealed during Tier 2 field studies. Formal consultation was not reinitiated for the bald eagle. This revised BO replaces the December 3, 2003 BO.

This programmatic BO is prepared in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.) and is the culmination of formal section 7 consultation under the Act. The purpose of formal section 7 consultation is to insure that any action authorized, funded, or carried out by the Federal government is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of any officially designated critical habitat of such species. This BO covers the proposed actions of the FHWA, as this agency will partially fund the road construction associated with this project.

Road construction that will occur as part of this proposed project will also require a permit(s) from the U.S. Army Corps of Engineers (COE). However, the COE permits will not result in any impacts to Indiana bats or bald eagles beyond those addressed in this consultation with the FHWA. Therefore, the Service intends to provide a copy of this BO to the COE to demonstrate that the FHWA has fulfilled its obligations to consult with the Service.

This BO is primarily based on information provided from the following sources:

1) an original I-69 Tier 1 BA [dated July 18, 2003, revised October 27, 2003; prepared by Bernardin-Lochmueller and Associates, Inc.(BLA)],
2) a Tier 1 BA Addendum (dated March 7, 2006; prepared by BLA),

3) Tier 1 National Environmental Policy Act (NEPA) documents for the I-69 project (Draft EIS, Final EIS and ROD),
4) The I-69 Evansville to Indianapolis Tier 1 (tolling option) Re-evaluation Report (dated June 23, 2006; prepared by BLA),
5) numerous technical reports from I-69 Tier 2 field surveys and related studies,
6) reports and scientific literature on Indiana bat and bald eagle research conducted in the action area and elsewhere, and
7) meetings, phone calls, e-mails, other written correspondence with FHWA, INDOT, and their consultants. A limited number of field visits and site investigations were also conducted by personnel from the Service's BFO. A complete administrative record of this consultation is on file at BFO.

CONSULTATION HISTORY

The proposed action has a background that encompasses several decades of planning and planning studies by INDOT and is outlined in Chapter 1 of the Tier 1 DEIS. Studies since 1990 have been focused on the currently proposed project area. The 1996 DEIS for the Southwest Indiana Highway Project follows the currently proposed 3C alignment very closely.

In 1989-90, the Southwest Indiana Highway Feasibility Study (Indianapolis to Evansville, Rockport, or Tell City) (Donohue study) addressed three feasible north-south routes, all of which used SR 37 from Bloomington to Indianapolis. That study found Alternative A, from Evansville to Indianapolis, economically feasible based on optimistic assumptions for business attraction.

An environmental study for the Indianapolis to Evansville Highway was done in 1990. This study was based on Alternative A from the 1989-90 feasibility study. The corridor was separated into three sections and did not consider upgrading SR 37 to an Interstate. Section 1 (Bloomington to Newberry) was developed as an EIS, while section 2 (Newberry to Petersburg) and section 3 (Petersburg to Evansville) were developed as preliminary overviews for detailed studies to come later. In 1992, the decision was made to consolidate all three sections of the 1990 study into a single DEIS between Evansville and Bloomington.

The DEIS for the Southwestern Indiana Highway Project (Evansville to Bloomington) was published in 1996. The preferred route studied in the 1996 DEIS closely followed what is now known as Alternative 3C, the preferred alternative for proposed I-69. For the 1996 study, karst features were investigated, forest plots were surveyed, and wetlands were delineated, in addition to other standard NEPA elements. That document included extensive fish, wildlife, and plant field surveys; and literature review.

In 1998, INDOT decided to expand the scope of the EIS for the Southwest Indiana Highway Project to include consideration of the need for an Evansville-to-Indianapolis link in the context of the planned extension of I-69. With the major change in scope, new corridor alternatives were evaluated. The result of this expanded study culminated in FHWA and INDOT initiating a two-tiered NEPA process and the release of the Tier 1 DEIS for proposed I-69 in July 2002 and the subsequent July 2003 submittal of a Tier 1 Biological Assessment with FHWA's request to initiate formal section 7 consultation on Alternative 3C, INDOT's preferred alternative. The Tier 1 DEIS and BA only summarized existing data as no new field studies were conducted as part of Tier 1. The Service issued its original programmatic BO on December 3, 2003, which concluded that the project was not likely to jeopardize the continued existence of the Indiana bat or bald eagle. This formal consultation also provided FHWA and INDOT with an outline for submitting subsequent Tier 2 BAs for each of the six Tier 2 Sections. Under the December 2003 Tier 1 BO, each of the Tier 2 section-specific BAs was required to show how impacts associated with each particular section are consistent with those described in the Tier 1 BO.

INDOT and FHWA published a Tier 1 FEIS, which selected Alternative 3C as the preferred corridor. On March 24, 2004, the FHWA approved the 3C corridor and made numerous mitigation commitments by signing and releasing its Record of Decision (ROD) for the project.

During the summer of 2004, INDOT's consultants began Tier 2 field studies within and around the 3C, approximately 2000-foot-wide corridor including mist net surveys at 148 sites and radio-tracking of Indiana bats captured along the proposed corridor. A total of 48 Indiana bats, including reproductive adult females and juveniles (i.e., evidence of nearby maternity colony), was captured from sites scattered among all six sections of I-69. Based on these 2004 bat captures and associated radio-tracking studies, the Service informed INDOT that there was now evidence of at least 13 Indiana bat maternity colonies within the project's SAA. Additional mist netting and radio tracking was conducted at 49 sites during the summer of 2005 in an attempt to locate additional primary roost trees for each of the 13 Indiana bat maternity colonies.

A meeting was held on July 1, 2005 with FHWA, INDOT, and the Service to discuss Section 7 consultation during Tier 2 studies for the I-69 Evansville to Indianapolis project. At this meeting, the Service stated that FHWA and INDOT should consider reinitiating formal Section 7 consultation for the entire I-69 corridor from Evansville to Indianapolis for impacts to the Indiana bat, because so much new field data had been collected in 2004 and 2005 concerning that species. Such new information included results from mist netting surveys and radio-tracking studies, roost tree identification, roost tree emergence counts, bridge surveys for Indiana bat summer habitat, and results from fall/spring cave harp trapping and winter cave surveys for Indiana bats. The Service indicated that the formal consultation process would conclude with the issuance of a revised programmatic BO for the entire Alternative 3C corridor. INDOT and FHWA agreed that a reinitiation of formal section 7 consultation for the Indiana bat was warranted.

Over several months time during the fall of 2005, INDOT's primary consultant for I-69, BLA, informally consulted with the Service during weekly meetings to decide what data should be included in the Tier 1 BA Addendum and how it should be presented. Also, in February 2006, the Service, INDOT and FHWA signed a pre-consultation agreement, which outlined the mutual understanding of expectations for the I-69 Tier 1 formal consultation reinitiation, subsequent Tier 2 consultations, and mitigation commitments for the Indiana bat. Extensive coordination occurred between INDOT's consultants and the Service while the Tier 1 BA Addendum was being prepared. A draft of the Addendum was requested by the Service, but was not received. The FHWA submitted the BA Addendum to the Service on March 7, 2006 with a letter requesting the reinitiation of formal consultation. Due to extraordinarily high work loads stemming from the forthcoming Revised Indiana Bat Recovery Plan, the Service's BFO staff was incapable of completing a review of the BA Addendum until the end of June 2006. By this time, the 90-day formal consultation period had technically ended, but the BFO verbally informed the FHWA that it intended to complete the formal consultation and issue a revised BO by the end of the statutory 135-day period if at all possible. During a meeting on July 17, 2006, FHWA and INDOT agreed to provide the Service some additional information regarding impacts in the vicinity of Cave and they and the Service mutually agreed to extend the consultation period beyond the 135-day period, with the understanding that a draft BO would be submitted for review on or before July 28, 2006.

A chronological summary of important consultation events and actions associated with this project is presented below.

Summary of NEPA and section 7 consultation history for the currently proposed action.

Date	Event / Action
February 3, 2000	INDOT and FHWA hosted a "Scoping Meeting" with environmental review agencies.
June 5, 2001	INDOT and FHWA convened an agency review meeting to discuss the "Purpose and Need Statement" (including a comparison of Tier 1 & 2 EIS)
November 27, 2001	INDOT and FHWA convened an agency review meeting to discuss their "Screening of Alternatives" for I-69 (included environmental information).
December 21, 2001	BFO sent a letter to BLA with comments on the Draft Level 2 Alternatives Analysis Report for the Evansville to Indianapolis I-69 study including endangered species and critical habitat technical information.
March 14, 2002	Federally listed species were reviewed and appropriate tables constructed with species, their number and status and presented to the USFWS at the BFO.
June 4 and 5, 2002	A BFO biologist took a two-day bus tour of I-69 alternatives focused on environmentally sensitive areas with INDOT, FHWA, USEPA, IDNR, and BLA representatives.
June 2002	Through informal consultation with the Service INDOT agreed to shift the common alignment of Alternative 3A, B, and C to be beyond the range of bats that forage around and hibernate in Cave, which is Designated Critical Habitat for the Indiana bat in Greene County
June 27, 2002	FHWA sent a letter to BFO requesting a list of Federally listed species and Designated Critical Habitat that may be present in the I-69 study area of 5 alternatives being carried forward for detailed analysis in the DEIS.
July 1, 2002	BFO sent FHWA a species list for all 5 alternatives that included 6 species and one cave Designated Critical Habitat for the Indiana bat that may be present within the proposed project counties.
July 22, 2002	INDOT and FHWA released their Tier 1 DEIS for public comment
November 14, 2002	BFO commented on the Tier 1 DEIS are combined with those of the National Park Service and sent in single letter from the Department of the Interior's Washington Office to FHWA.
January 9, 2003	Governor Frank O'Bannon announced Alternative 3C as INDOT's recommendation as the "preferred alternative" for I-69.
February 21, 2003	FHWA requests a species list for their preferred alternative, 3C.
February 28, 2003	FHWA sends BFO a letter requesting comments on regarding the four variations of Alt. 3C around the City of Washington.
March 11, 2003	An Agency Coordination Meeting was held at BFO to discuss a Conceptual Tier 1 Forest and Wetland Mitigation Plan, Sections of Independent Utility, the proposed Patoka River crossing, and how the sec. 7 consultation would coincide with Final EIS preparation.
March 13, 2003	BFO sent FHWA a letter listing 3 species that may be present in the Alternative 3C study area, Indiana bat, bald eagle, and fanshell mussel.

March 14, 2003	BFO sent FHWA a letter advising them to choose one of the two eastern routes around Washington (variation "WE1" was specifically recommended) as they were less likely to have adverse affects to Indiana bats or bald eagles because impacts to forest and wetlands would be smaller.
March 26, 2003	BLA sent BFO a Draft BA addressing effects to Alt. 3C on Indiana bats, bald eagles, and fanshell mussels and requested our review and comments.
May 30, 2003	BFO returned comments on Draft BA to BLA.
June 15 – July 2003	BFO assisted INDOT and BLA in developing Conservation Measures to be included in the BA that would avoid and minimize incidental take of Indiana bats and bald eagles.
July 21, 2003	BFO received a revised BA and letter from FHWA requesting formal section 7 consultation for the effects of Alt. 3C of I-69 on Indiana bats and bald eagles. The letter also requested our concurrence that fanshell mussels were not likely to be adversely affected by Alt. 3C. (the 135-day formal consultation timeframe began).
August 22, 2003	BFO sent FHWA a letter acknowledging receipt and completeness of formal consultation initiation package. Informed FHWA that the Service expected to provide them with a final Biological Opinion no later than December 3, 2003. Based on information contained in the BA, the Service also provided the FHWA our written concurrence with their determination that the fanshell mussel was "not likely to be adversely affected" by the proposed construction, operation, and maintenance of Alternative 3C of I-69.
August – November 2003	BFO consulted with FHWA/INDOT/BLA to gain clarification on various issues resulting in several revisions to the Tier 1 BA.
November 28, 2003	BFO sent FHWA/INDOT/BLA a draft Biological Opinion for review.
December 2, 2003	FHWA/INDOT/BLA returned comments on draft BO to BFO.
December 3, 2003	BFO sent FHWA/INDOT/BLA the Final Biological Opinion for Alternative 3C of I-69.
December 2003	INDOT released Final EIS with 3C named as its preferred alternative
February 2004	FHWA issued a Record of Decision approving the 3C corridor
Summer 2004	Tier 2 Mist net surveys revealed the presence of 13 maternity colonies and scattered occurrences of male Indiana bats throughout the 3C corridor.
Fall-Winter-Spring 2004 and 2005	Tier 2 surveys at caves within 5 miles of the 3C corridor revealed limited seasonal use by Indiana bats at a small number of caves without previous documented use by Indiana bats.
Summer 2005	Additional mist netting and radio-tracking located additional Indiana bat roost trees within the 13 maternity colony areas.
July 1, 2005	FHWA and INDOT met with Service and agreed to reinitate formal consultation on Tier 1 of I-69 in light of all the new information on Indiana bat maternity activity and hibernacula in the project area.
Fall 2005	BLA and BFO staff held weekly meetings in order to guide development of the Tier 1 BA Addendum
February 2006	FHWA, INDOT and the Service signed a Pre-consultation Agreement
March 7, 2006	FHWA submitted a Tier 1 BA Addendum to the Service with a letter requesting to reinitiate formal consultation for the Indiana bat.
June and July 2006	BFO consulted with FHWA/INDOT/BLA to gain clarification on various issues discussed within the BA Addendum.
July 10, 2006	BFO reviewed and submitted comments on the Tier1 Re-evaluation Report for I-69, which outlined anticipated impacts resulting from the interstate being a toll road.
July 17, 2006	BFO met with FHWA FHWA/INDOT/BLA to discuss findings of the Tier 1

	Re-evaluation Report and other issues. It was agreed to expand the Winter Action Area to include Cave, which would necessitate FHWA/ INDOT/BLA to provide additional data to BFO and an effects determination on Cave as Critical Habitat. It was mutually agreed to extend the formal consultation period to accommodate these changes.
July 20, 2006	BFO received a letter from FHWA stating that it determined that I-69 "*may effect, but is not likely to adversely affect*" Cave as Critical Habitat for the Indiana bat. They also provided additional information regarding impacts around this cave and revised data for the revised Winter Action Area.
July 26, 2006	The Service provided FHWA with a draft of the revised BO and ITS for review.
August 11, 2006	FHWA/INDOT/BLA returned comments on the draft revised BO and ITS to the Service.
August 21, 2006	The Service provided FHWA with a revised draft ITS for review.
August 23, 2006	FHWA/INDOT/BLA returned additional comments on the revised draft BO and ITS to the Service.
August 24, 2006	BFO concluded formal consultation on Tier 1 by issuing FHWA and INDOT a Final Revised Programmatic Biological Opinion and Incidental Take Statement for Alternative 3C of I-69.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The Federal Highway Administration (FHWA) and the Indiana Department of Transportation (INDOT) are proposing construction of I-69 from Evansville to Indianapolis, Indiana. The study of proposed I-69 from Evansville to Indianapolis, Indiana is a comprehensive National Environmental Policy Act (NEPA) study that will be carried forward in two tiers. Tier 1 of the study involved extensive environmental, transportation, and economic studies, and cost analysis. The Tier 1 Environmental Impact Statement (EIS) provided a basis for the FHWA to grant approval for a specific corridor. In most cases, the corridor is approximately 2000 feet wide, but has been narrowed or widened in some instances to avoid or provide room to avoid sensitive environmental areas. A working alignment within the corridor, ranging from approximately 270 – 470 feet wide, was developed to estimate potential impacts for the Tier 1 study. The Tier 1 study was completed on March 24, 2004 with the issuance of the Tier 1 Record of Decision (ROD) signed by FHWA. Alternative 3C was determined to be the Preferred Alternative for this project. Alternative 3C is near SR 57 from Evansville to Washington, crossing the Patoka River National Wildlife Refuge acquisition boundary. The alternative continues overland east around Washington to Elnora then turns east toward Bloomington. From Bloomington, the alternative is located along existing SR 37 to connect to I-465 at Indianapolis (Figure 1).

With the aid of FHWA funds, INDOT is proposing to construct, operate, and maintain a new extension of an Interstate highway, I-69, approximately 142 miles long, connecting Evansville and Indianapolis, via Oakland City, Washington, Crane, Bloomington, and Martinsville, Indiana. Approximately 35% of the proposed route would be mostly within the footprint of an existing 4-lane highway, SR 37; however, the remaining 65% or approximately 90 miles of interstate would be constructed off of existing highways on new-terrain. The proposed action would also involve constructing/reconstructing approximately 33 interchanges, but the actual number may change in Tier 2, as well as new frontage roads, access roads, and improvements to existing roads. The project is part of a larger, national proposal to connect the three North American trading partners of Canada, the United States, and Mexico by an Interstate highway in the states of Michigan, Indiana, Kentucky, Tennessee, Mississippi, Arkansas, Louisiana, and Texas. The purpose of the proposed I-69 Evansville to Indianapolis Project is to provide an improved transportation link between Evansville and Indianapolis that: 1) strengthens the transportation network in southwestern Indiana, 2) supports economic development in southwestern Indiana, and 3) completes the portion of the National I-69 project between Evansville and Indianapolis.

Tier 2 NEPA studies are currently being conducted to determine a specific alignment within the selected corridor. The corridor selected in Tier 1 has been divided into six (6) sections. To provide more flexibility, Tier 2 NEPA studies will be conducted on each project section rather than singly on the entire route. The six (6) project sections to be carried forward to Tier 2 are (traveling northeast) (Figure 2):

1. From I-64 (near Evansville) via the SR 57 corridor to SR 64 (near Princeton/Oakland City)
2. From SR 64 (near Princeton/Oakland City) via the SR 57 corridor to US 50 (near Washington)

3. From US 50 (near Washington) via the SR 57 corridor and cross country to US 231 (near Crane Naval Surface Warfare Center (NSWC))
4. From US 231 (near Crane NSWC) via cross country to SR 37 (south of Bloomington)
5. From SR 37 (south of Bloomington) via SR 37 to SR 39 (Martinsville)
6. From SR 39 (Martinsville) via SR 37 to I-465 (Indianapolis)

The width of the typical interstate sections differ depending on three factors: 1) flat versus hilly topography (broadly determined by physiographic region), 2) number of traffic lanes needed, and 3) number, if any, of frontage roads needed.

The possibility of I-69 as a toll road is currently being studied as a part of a re-evaluation of the Tier 1 EIS. This was not originally considered in the Tier 1 BA. At this time, each Tier 2 Section consultant is evaluating each alternative as a toll road and as a non-toll road.

In the Tier 2 DEISs for each project section, it is anticipated that a preferred location alternative will be identified. A preferred financing option will be identified in either the Tier 2 DEIS or the Tier 2 FEIS for each section. Thus uncertainty regarding the funding of the interstate remains at this time.

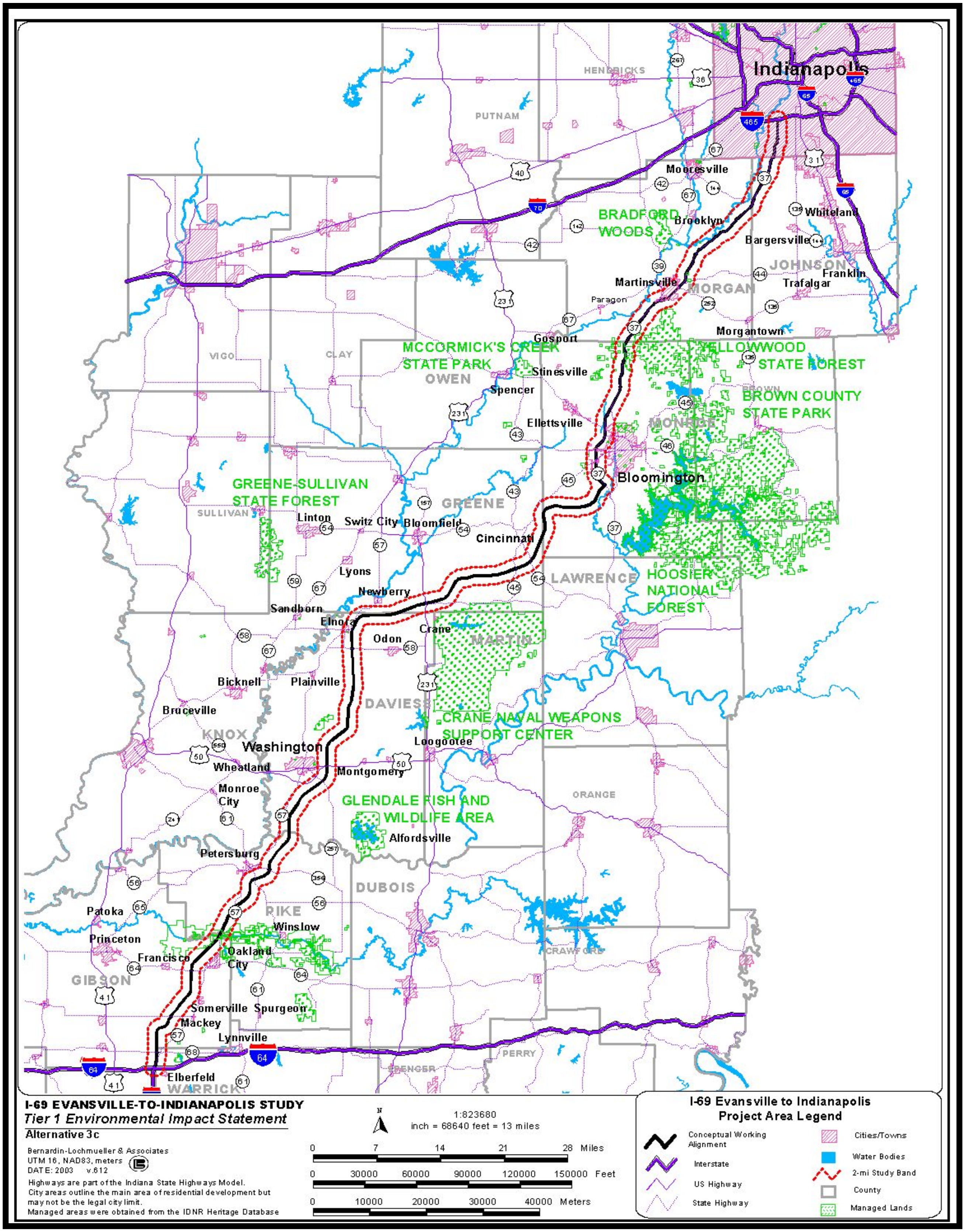

Figure 1. Proposed corridor for I-69 from Evansville to Indianaplis (Alternative 3C).

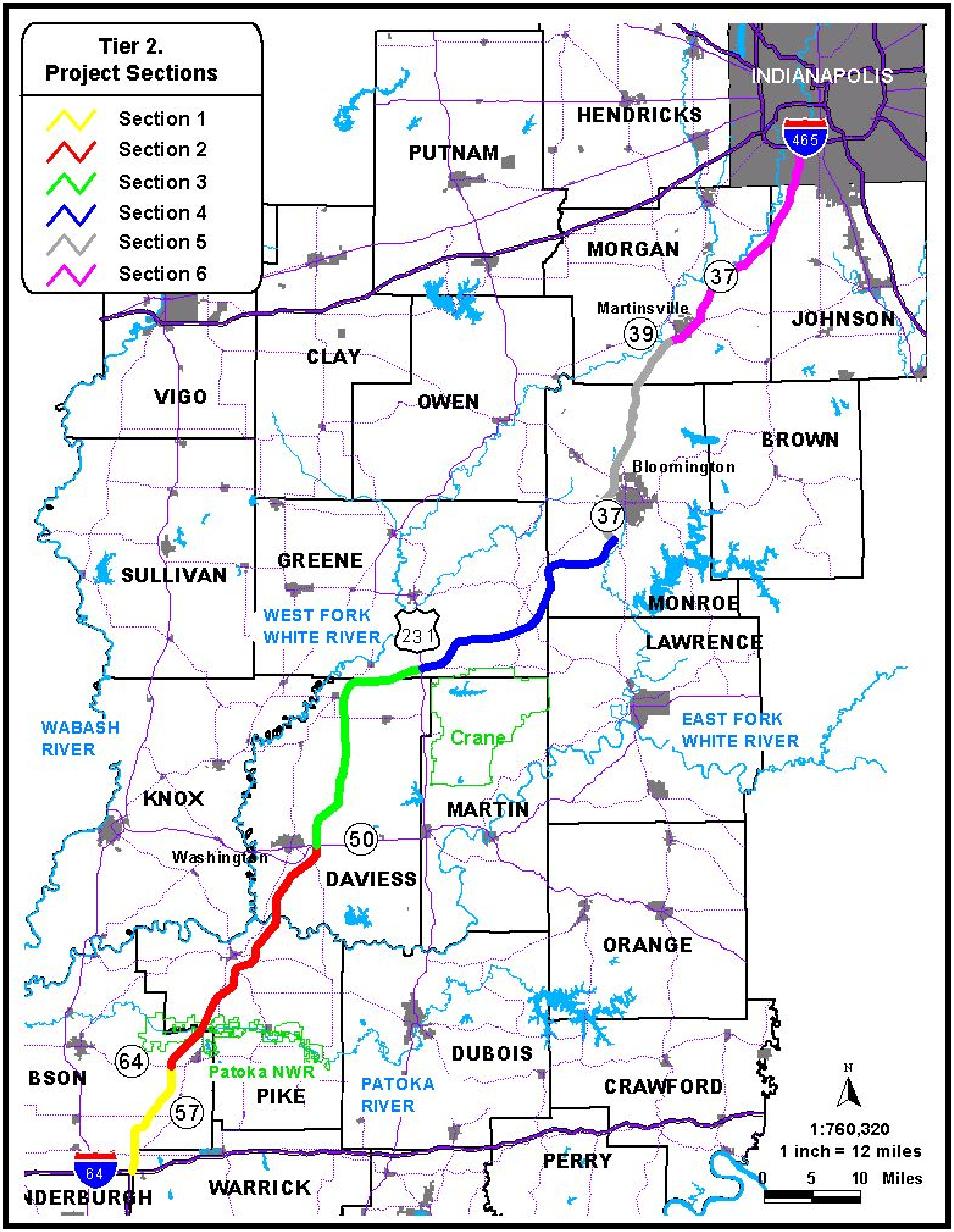

Figure 2. Tier 2 project sections.

The FHWA’s Tiered Approach

The FHWA’s National Environmental Policy Act (NEPA) studies for proposed I-69 from Evansville to Indianapolis, Indiana are being completed in two tiers. The Council on Environmental Quality (CEQ) guidelines and Federal Highway Administration (FHWA) guidelines allow NEPA studies for large, complex projects to be completed in a two-staged or “tiered” process. Tier 1 of the study involved extensive environmental, transportation, and economic studies, and cost analyses, but no field studies. The final Tier 1 NEPA document was an Environmental Impact Statement (EIS) that provided a basis for the FHWA to grant approval for INDOT’s preferred corridor, Alternative 3C. In most cases, the proposed 3C corridor is approximately 2000 feet wide, but has been narrowed in some instances to avoid sensitive environmental areas. A “working alignment” within the 2000-foot corridor, ranging from approximately 270 to 470 feet wide, was developed to estimate the potential impacts analyzed in the Tier 1 BA and Tier 1 BA Addendum. It is important to note that specific alignment decisions within a project section will not be finalized until after the Tier 2 study processes and consultations have been completed for each project section.

Tier 2 NEPA studies will be conducted to determine a specific alignment within the selected corridor. The 3C corridor that was selected at the completion of Tier 1 has been divided into six “project sections” in Tier 2. To provide more flexibility, detailed Tier 2 NEPA studies will be conducted on each project section rather than singly on the entire route. Each Tier 2 study will look beyond its project termini to determine if there is anything sensitive just beyond the termini that would affect the location of the adjoining project. This will provide additional assurance that decisions made in one section do not prematurely preclude consideration of alternatives within the preferred corridor for adjoining sections. In general, the range of alternatives in Tier 2 are confined to the corridor selected in Tier 1. In some instances, interchanges and access roads for Tier 2 alternatives extend outside the corridor. Flexibility exists to consider alternatives outside the corridor, with consultation, if necessary to avoid unanticipated impacts.

Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan

During Tier 1, INDOT and FHWA developed a Tier 1 Forest and Wetland Mitigation and Enhancement Plan (“Plan”) for the proposed project in consultation with the USFWS and other review agencies. This Plan described 17 potential sites where wetland and forest restoration and conservation efforts would be targeted. These sites were “conceptual” in nature, and were general areas rather than specific parcels of land. The Plan was intended to provide a list of potential mitigation sites. The actual mitigation sites to be implemented for the project will be determined during or following Tier 2, in consultation with the USFWS, and could include different sites than those identified in the Plan. A copy of the original Tier 1 Forest and Wetland Mitigation and Enhancement Plan, was included as Appendix NN in the Tier 1 FEIS, Volume II, and is hereby incorporated by reference.

Appendix D of the Tier1 BA Addendum contained a Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan and his hereby incorporated by reference. This conceptual Revised Tier 1 Plan is an updated version of the original Tier 1 Forest and Wetland Mitigation and Enhancement Plan. The Tier 1 Forest and Wetlands Mitigation and Enhancement Plan included a commitment to replace wetlands at a ratio of 3:1 for forested and scrub/shrub wetlands, and a ratio of 2:1 for emergent wetlands. In addition to wetland mitigation, the Plan included a commitment to mitigate for upland forests at a ratio of 3:1. In addition to these amounts, a buffer for each wetland mitigation site was included within the Plan totaling 55 acres. Based on impact estimates available in Tier 1, the Plan included *estimated* acreages for forest and wetlands mitigation and identified *potential* forest and wetland mitigation sites.

The Plan noted that if impacts were reduced below the levels estimated in Tier 1, then the level of mitigation acreage required under the Plan would be reduced accordingly; similarly, if the impacts were higher than estimated in Tier 1, then the mitigation acreage would increase. The Plan also noted that further enhancements to the mitigation measures listed in the Plan would be determined in consultation with the USFWS and other regulatory agencies on a case-by-case basis in Tier 2. The Plan also noted that the mitigation sites identified in the Plan were conceptual, and that specific mitigation sites would be determined during or after Tier 2 and noted that INDOT would acquire mitigation sites only from willing sellers at fair market value.

Consideration in December 3, 2003 Biological Opinion

The USFWS's original Biological Opinion for the project, issued on December 3, 2003, included a description of the Tier 1 Forest and Wetland Mitigation and Enhancement Plan (Tier 1 B.O., pp. 8-10.) The USFWS specifically considered the Plan as part of the analysis that supported its no-jeopardy finding for the project. (Tier 1 B.O., pp. 74-75). In addition, the USFWS required implementation of the measures contained in the Plan, or equivalent measures deemed satisfactory by the USFWS, as one of the mandatory terms and conditions in the Incidental Take Statement for the Indiana bat. (Tier 1 B.O., p. 79).

Updates to Tier 1 Mitigation and Enhancement Commitments

The re-initiation of Section 7 consultation for the entire I-69 Evansville to Indianapolis project provides an opportunity to review and, where appropriate, update the Tier 1 mitigation and enhancement commitments. Updates are appropriate where new information has been developed about the project's impacts or about specific mitigation sites; modifications also may be appropriate in order to clarify statements in the original Plan. Any updates contained in the Tier 1 BA Addendum, will supersede commitments in the original mitigation plan, and are incorporated into this revised Biological Opinion for the I-69 project.

Mitigation Commitments

Statements within the Tier 1 BA Addendum, indicated that FHWA and INDOT have re-affirmed their commitment to the mitigation ratios provided in the Tier 1 Forest and Wetlands Mitigation and Enhancement Plan. These mitigation ratios are summarized in Table 1 of the BA Addendum provided below.

Table 1. Tier 1 Mitigation Commitments

Resource Type	Mitigation Ratio
Forested Wetlands	3:1
Scrub/Shrub Wetlands	3:1
Emergent Wetlands	2:1
Upland/Bottomland Forest	3:1
Wetlands Buffer	Include additional land as buffer around wetlands mitigation sites

Estimated Mitigation Acreages

As noted above, the Tier 1 BA included *estimates* for mitigation acreages, based on then available information about the project's impacts. It did not commit to providing a specific number of acres of mitigation land. Consistent with that approach, the Tier 1 BA Addendum included updated estimates of the mitigation acreages for forest and wetlands (see Table 2.)

To provide a conservative/worst-case scenario, the updated estimates in the Tier 1 BA Addendum have been based on a representative alignment within each section that have the highest impact to Tier 2 forest, from among the alignments under consideration in the Tier 2 studies as of November 14, 2005. (The "representative alignment" used in the Tier 1 BA Addendum differs from the "working alignment" considered in the Tier 1 study.) The term "Tier 2 forest" is explained below at p. 32.

Tier 2 forest was determined from 2003 aerial photographs, high resolution aerial photographs of the corridor, and field reconnaissance by Tier 2 Environmental and Engineering Assessment Consultants (EEACs). The EEACs are responsible for specific, detailed evaluations of each Tier 2 Section. The new forest data shows greater overall forest coverage when compared to the forest data used in the original Tier 1 analysis and formal consultation. The revised forest data used in this analysis was discussed in greater detail on page 25 of the BAA. It is likely that the actual impacts will be somewhat lower than this estimate, due to the ongoing efforts to avoid and minimize impacts to forest and wetlands. The highest forest impact alignments have been used in order to provide a "reasonable worst-case" estimate of the Tier 2 forest impacts for the alternatives that are being considered in the Tier 2 studies. Since actual impacts are likely to be somewhat lower, it is expected that the corresponding mitigation acreages will also be somewhat lower than those presented here.

Table 2. Estimated Forest and Wetland Impacts & Mitigation

Habitat / Mitigation Ratio	Tier 1 BA Estimated Impacts (acres)	Tier 2 BA Estimated Impacts (acres)*	Tier 1 BA Estimated Mitigation (acres)	Tier 2 BA Estimated Mitigation (acres)*
Forested Wetlands / 3:1	65	100	198 – 214	300
Scrub / Shrub Wetlands / 3:1	5	5	15 – 20	15
Emergent Wetlands / 2:1	5	15	6 -10	30
Wetland Buffer/Prairies (25%)	----	----	55 – 72	90
Upland Forests / 3:1	1,062	2,050	3,186 – 3,773	6,150
Total	**1,137**	**2,170**	**3,461 – 4,089**	**6,585**

* Tier 2 Impacts and Mitigation Offered were rounded up to increments of 5. Impact estimates for the Addendum have been based on the Tier 2 alignment with the highest impacts to forest. Actual impacts are expected to be lower; as a result, actual mitigation acreages also are likely to be lower.

Both the harmful and beneficial effects of the "Tier 2 BA" estimated impacts and proposed mitigation acreages presented in Table 2 were taken into consideration for both our jeopardy and incidental take analyses of this revised BO.

Principles for Selecting Mitigation Sites

Mitigation sites and easements will only be purchased from willing sellers at fair market value. FHWA and INDOT propose the following principles to guide the selection of forest and wetlands mitigation sites for the project:

a. Wherever possible, mitigation for impacts in the vicinity of an Indiana bat maternity colony will be provided (if willing sellers are available for a price at fair market value) within a 2.5-mile radius of the estimated central location of the colony. The area within this 2.5-mile radius is referred to in this document as the maternity colony roosting and foraging area. Maps in Appendix D of the BAA show the location of mitigation priority areas for the 13 identified maternity colonies. Where mitigation cannot be provided within the maternity colony roosting and foraging area, any additional mitigation for impacts to the colony will be provided elsewhere within the SAA or at other locations acceptable to the USFWS, FHWA, and INDOT.

b. Mitigation will include both the protection of existing habitat (through acquisition of easements or other ownership interests in the property) and the creation of new habitat (through reforestation and wetlands creation). The balance between protecting and creating habitat will be determined as part of the Section 7 consultation process for Tier 2 BAs.

c. Mitigation measures that include property acquisition (including acquisition of easements) will be carried out only with willing sellers at fair market value. When seeking to acquire sites for mitigation purposes, FHWA and INDOT will try to identify potential willing sellers and try to reach an agreement with them.

d. The USFWS will be consulted prior to acquisition of sites that are intended to be used as mitigation for impacts to the Indiana bat.

e. On a project-wide basis, FHWA and INDOT will provide mitigation for upland forest impacts at a ratio of 3:1 as committed in the Tier 1 FEIS and ROD. Some of the land used to meet this 3:1 commitment may be located outside the Indiana bat Action Areas and thus may not always constitute mitigation for the Indiana bat. Consultation with the USFWS will determine what will be deemed appropriate for Indiana bat mitigation. Mitigation goals are to replace direct forest impacts at a 1:1 ratio and provide an additional 2:1 ratio of forest preservation.

f. Mitigation for impacts to the Indiana bat maternity colonies will be determined on a case-by-case basis and will be located within the Indiana bat Action Areas. The appropriate mitigation ratio for impacts to the Indiana bat will be determined as part of the Tier 2 Section 7 process, taking into account the type and location of the mitigation, as well as the nature of the impacts. The mitigation provided for the Indiana bat within the Action Area may be provided at a ratio of less or greater than 3:1, if a lower or higher ratio is determined to be appropriate as part of the Tier 2 Section 7 process.

g. Mitigation for impacts to the Indiana bat may also serve as mitigation for other environmental resources, such as wetlands.

Mitigation for wetlands will be replaced in the same 8-digit watershed and at ratios described in INDOT's Wetland Memorandum of Understanding (MOU) dated January 21, 1991. Mitigation sites in upland forested areas will be incorporated with wetland areas and other forested areas when feasible in an effort to expand existing core forest habitat and otherwise augment existing ecological communities. Potential mitigation sites also were specifically targeted to create/enhance habitat for Federal and state threatened, endangered, and rare species. For example, potential sites near large, open water bodies were targeted as appropriate habitat for bald eagles. Likewise some forested areas near known Indiana bat hibernacula were targeted because they provide suitable foraging and roosting habitat for the bats. Detailed information pertaining to each potential mitigation site is provided in the Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan and is hereby incorporated by reference.

Conservation Measures

The following conservation measures were jointly developed by the FHWA, INDOT, and the Service during informal consultation and were subsequently incorporated into the Tier 1 BA and the Tier 1 BA Addendum as part of the official Proposed Action for the I-69 project. Since conservation measures are part of the Proposed Action, their implementation is required under the terms of the consultation. These measures were specifically designed to avoid and minimize impacts of the proposed action on Indiana bats and bald eagles and to further their recovery. **The Service has analyzed the effects of the Proposed Action based on the assumption that all conservation measures will be implemented or equivalent measures developed in consultation with the Service during or following Tier 2.** The beneficial effects of the following measures were taken into consideration for both our jeopardy and incidental take analyses.

INDIANA BAT (*Myotis sodalis*)

A. CONTEXT SENSITIVE SOLUTIONS

WINTER HABITAT

1. **Alignment Planning -** Efforts will be made to locate Interstate alignments beyond 0.5 miles from known Indiana bat hibernacula.
   Status Report **– All alternatives have been located greater than 0.5 miles from any of the 14 known hibernacula.**

2. **Blasting -** Blasting will be avoided between September 15 and April 15 in areas within 0.5 miles of known Indiana bat hibernacula. All blasting in the Winter Action Area (WAA) will follow the specifications developed in consultation with the USFWS and will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of nearby caves serving as Indiana bat hibernacula.
   Status Report – To be completed.

3. **Hibernacula Surveys –** A plan for hibernacula surveys (caves and/or mines) will be developed and conducted in consultation with and approved by USFWS during Tier 2 studies.
   Status Report – Plan was completed with USFWS and fieldwork has been completed. To date, 373 cave records were evaluated and 250 caves were visited in the field. Of these, sixty-one caves were surveyed for Indiana bats in 2004-2005 and 16 caves had fall harp trapping in 2005. The 16 caves that were harp trapped in the fall of 2005 also had internal cave surveys completed in December 2005. Three new Indiana bat hibernacula were identified as a result of these surveys.

4. **Karst Hydrology –** To avoid and minimize the potential for flooding, dewatering, and/or microclimate (i.e., temperature and humidity) changes within hibernacula, site-specific efforts will be made to minimize changes in the amount, frequency, and rate of flow of

roadway drainage that enters karst systems that are determined to be hydrologically connected to Indiana bat hibernacula.

<u>Status Report</u> – The only hibernaculum for which hydrological connectivity with the corridor has been established is Cave. Karst feature dye tracing from inputs within the corridor established a positive dye trace to Cave in December 2005. Efforts will be made to minimize any disturbance to the hydraulic/hydrologic function of these features, and their relationship to Cave, thus minimizing any potential changes to the hibernaculum microclimate.

<u>AUTUMN/SPRING HABITAT</u>

5. **Tree Removal –** To minimize adverse effects on bat habitat, tree (three or more inches in diameter) cutting will be avoided within five miles of a known hibernaculum. If unavoidable, cutting will only occur between November 15 and March 31.

   <u>Status Report</u> - To be completed.

<u>SUMMER HABITAT</u>

6. **Alignment Planning** - Efforts will be made to locate Interstate alignments so they avoid transecting forested areas and fragmenting core forest where reasonable.

   <u>Status Report</u> – Efforts have been made to avoid and minimize fragmenting forests.

7. **Tree Removal -** Tree and snag removal will be avoided or minimized as follows:

   a. **Tree Cutting -** To avoid any direct take of Indiana bats, no trees with a diameter of 3 or more inches will be removed between April 15 and September 15. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. In the median, outside the clear zone, tree clearing will be kept to a minimum with woods kept in as much a natural state as reasonable. Forested medians will be managed following IDNR State Forest timber management plan.

      <u>Status Report</u> – To be completed.

   b. **Mist Netting -** In areas with suitable summer habitat for the Indiana bat, mist net surveys will be conducted between May 15 and August 15 at locations determined in consultation with the USFWS as part of Tier 2 studies. If Indiana bats are captured, some will be fitted with radio transmitters and tracked to their diurnal roosts for at least 5 days unless otherwise determined by USFWS.

      <u>Status Report</u> – Completed. A total of 148 mist net sites was surveyed in 2004 and 49 sites were surveyed or resurveyed in 2005.

8. **Bridges –** Bridges will include the following design features:

   a. **Surveys –** The undersides of existing bridges that must be removed for construction of I-69 will be visually surveyed and/or netted to determine their use as night roosts by Indiana bats during the summer.

      <u>Status Report</u> – Completed. A total of 270 bridges and culverts was inspected for Indiana bats. Of the 259 bridge surveys, Indiana bats were found under one bridge. INDOT and FHWA have worked with the USFWS on fencing below this bridge at either end to avoid human disturbance. Both ends of the bridge have fencing, a gate, and a keyed lock. Monthly monitoring with USFWS is ongoing

throughout the summer of 2006. This bridge is greater than 1.5 miles from the proposed corridor with no direct forested connectivity to it.

b. **Bat-friendly bridges –** Where feasible and appropriate, Interstate and frontage road bridges will be designed to provide suitable night roosts for Indiana bats and other bat species in consultation with the USFWS.
Status Report – To be completed.

c. **Floodplains –** Where reasonable and appropriate, floodplains and oxbows will be bridged to protect environmentally sensitive areas. The Patoka River floodplain will be bridged in its entirety, thus minimizing impacts to many different habitats.
Status Report - To be completed.

9. **Stream Relocations –** Site-specific plans for stream relocations will be developed in design considering the needs of sensitive species and environmental concerns. Plans will include the planting of woody and herbaceous vegetation to stabilize the banks. Such plantings will provide foraging cover for many species. Stream Mitigation and Monitoring plans will be developed for stream relocations, as appropriate.
Status Report - To be completed.

ALL HABITATS

10. **Medians and Alignments –** Variable-width medians and Independent alignments will be used where appropriate to minimize impacts to sensitive and/or significant habitats. Context sensitive solutions will be used, where possible. This may involve vertical and horizontal shifts in the Interstate.
Status Report - To be completed.

11. **Minimize Interchanges -** Efforts have been made to limit interchanges in karst areas, thereby limiting access and discouraging secondary growth and impacts. In Tier 2, further consideration will be given to limiting the location and number of interchanges in karst areas.
Status Report - To be completed in consultation with USFWS.

12. **Memoranda of Understandings (MOUs) -** Construction will adhere to the Wetland MOU (dated January 28, 1991) and Karst MOU (dated October 13, 1993). The Wetland MOU minimizes impacts to the Indiana bat by mitigating for wetland losses, and creating bat foraging areas at greater ratios than that lost to the project. The Karst MOU avoids and minimizes impacts to the Indiana bat by numerous measures which protect sensitive karst features including hibernacula.
Status Report - Items 1-4 of the karst MOU are being addressed as part of Tier 2 studies. Additional items to be completed.

13. **Water Quality -** Water contamination will be avoided/minimized by the following:

a. **Equipment Service -** Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.
Status Report – To be completed.

b. **Roadside Drainage -** Where appropriate in karst areas, roadside ditches will be constructed that are grass-lined and connected to filter strips and containment basins.

Status Report – To be completed.

c. **Equipment Maintenance** - Construction equipment will be maintained in proper mechanical condition.
Status Report – To be completed.

d. **Spill Prevention/Containment –** The design for the roadway will include appropriate measures for spill prevention/containment.
Status Report – To be completed.

e. **Herbicide Use Plan** - The use of herbicides will be minimized in environmentally sensitive areas, such as karst areas that are protective of Indiana bats and their prey. Environmentally sensitive areas will be determined in coordination with INDOT and, as appropriate, INDOT consultants. Appropriate signage will be posted along the interstate to alert maintenance staff.
Status Report – To be completed.

f. **Revegetation** - Revegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be utilized beyond the clear zone. Revegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers, as appropriate, similar to the native seed mixes of other nearby states.
Status Report – To be completed.

g. **Low Salt Zones –** A low salt and no spray strategy will be developed in karst areas for this project. A signing strategy for these items will also be developed. The low salt zones will be determined in coordination with INDOT.
Status Report – To be completed.

h. **Bridge Design –** Where feasible and appropriate, bridges will be designed with none or a minimum number of in-span drains. To the extent possible, the water flow will be directed towards the ends of the bridge and to the riprap drainage turnouts.
Status Report – To be completed.

14. **Erosion Control** - Temporary erosion control devices will be used to minimize sediment and debris. Timely revegetation after soil disturbance will be implemented and monitored. Revegetation will consider site specific needs for water and karst. Erosion control measures will be put in place as a first step in construction and maintained throughout construction.
Status Report – To be completed.

15. **Parking and Turning Areas –** Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing, and will avoid environmentally sensitive areas, such as karst.
Status Report – To be completed.

B. RESTORATION / REPLACEMENT

SUMMER HABITAT

1. **Summer Habitat Creation / Enhancement -** Indiana bat summer habitat will be created and enhanced in the Action Area through wetland and forest mitigation

focused on riparian corridors and existing forest blocks to provide habitat connectivity. The following areas and possibly others will be investigated for wetland and forest mitigation to create and enhance summer habitat for the Indiana bat: Pigeon Creek, Patoka River bottoms, East Fork of the White River, Thousand Acre Woods, White River (Elnora), First Creek, American Bottoms, Garrison Chapel Valley, Beanblossom Bottoms, White River (Gosport), White River (Blue Bluff), and Bradford Woods.

In selecting sites for summer habitat creation and enhancement, priority will be given to sites located within a 2.5 mile radius from a recorded capture site or roost tree. If willing sellers cannot be found within these areas, other areas may be used as second choice areas as long as they are within the Action Area and close enough to benefit these maternity colonies, or are outside the Action Area but still deemed acceptable to the USFWS.

Where appropriate, mitigation sites will be planted with a mixture of native trees that is largely comprised of species that have been identified as having relatively high value as potential Indiana bat roost trees. Tree plantings will be monitored for five years after planting to ensure establishment and protected in perpetuity via conservation easements.
<u>Status Report</u> – To be completed.

2. **Wetland MOU -** Wetlands will be mitigated at ratios agreed upon in the Wetland MOU (dated January 28, 1991). Wetland replacement ratios are as follows:
   - **a.** Farmed 1 to 1
   - **b.** scrub / shrub and palustrine / lacustrine emergent 2 - 3 to 1 depending upon quality
   - **c.** bottomland hardwood forest 3 – 4 to 1 depending upon quality
   - **d.** exceptional, unique, critical (i.e. cypress swamps) 4 and above to 1 depending upon quality.

<u>Status Report</u> – To be completed.

3. **Forest Mitigation -** The Tier 1 Forest and Wetland Mitigation and Enhancement Plan identifies the general location of potential mitigation sites for upland and bottomland forests. Preference will be given to areas contiguous to large forested tracts that have recorded federal and state listed species. The actual mitigation sites implemented will be determined in or following Tier 2 in consultation with the Service and other environmental review agencies. Coordination with the environmental review agencies will assure that these forest mitigation sites are strategically situated in biologically attractive ecosystems. Forest impacts will be mitigated at a ratio of 3 to 1. All forest mitigation lands will be protected in perpetuity via conservation easements. The 3:1 forest mitigation may not be located entirely within the Action Area. Forest impacts occurring within each of the 13 2.5-mile radius maternity colony areas would be mitigated by replacement (i.e. planting of new forest and purchase of existing) at approximately 3:1, preferably in the vicinity of the known roosting habitat.
<u>Status Report</u> – To be completed. In 2004, following the issuance of the Tier 1 ROD, INDOT provided funding to IDNR for the purchase of approximately 1500 acres of land from Indiana Power & Light (IPL; now managed by IDNR, Division of Forestry as "Ravinia Woods," a unit of the Morgan-Monroe State Forest) in Morgan County for use as forest mitigation for the I-69 project. The Ravinia Woods property is about 80% forested and lies approximately 0.5 mile beyond the assumed boundary of the West Fork - Bryant Creek maternity colony in Section 5. A narrow wooded riparian corridor along Burkhart Creek provides connectivity

between the West Fork - Bryant Creek colony and Ravinia Woods. INDOT considers this land to contribute to meeting a minimum 1:1 of the forest mitigation in Section 5. The remaining 2:1 for Section 5 will include reforestation and preservation within the SAA and maternity colony foraging area. The 1:1 ratio could be increased depending upon site-specific mitigation in Tier 2 and through future coordination with USFWS. At this time (estimates may change in the future as alignments are refined), Section 5 is estimated to result in a total of 303 acres of forest loss. Thus, 606 acres would be reforested and/or preserved within the SAA or maternity colony foraging area and 303 acres from the Ravinia Woods property would be included as the remaining forest mitigation.

C. CONSERVATION / PRESERVATION

WINTER HABITAT

1. **Hibernacula Purchase -** Opportunities will be investigated to purchase at fair market value from "willing sellers," an Indiana bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and implementation of all management efforts, the hibernaculum(a) and all buffered areas will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.
Status Report – To be completed.

2. **Hibernacula Protection** – With landowner permission, investigations will be coordinated with the USFWS on acquiring easements to erect bat-friendly angle-iron gates at cave entrances. These gates prevent unauthorized human access and disturbance of hibernacula, while maintaining free airflow within the hibernacula within the Action Area. Gates will be constructed according to designs from the American Cave Conservation Association. Effects of gates on water flow and flash flooding debris will be carefully evaluated before and after gates are installed. Other structures (e.g., perimeter fencing) or techniques (e.g., alarm systems and signs) may also be used.
Status Report – To be completed.

AUTUMN/SPRING HABITAT

3. **Autumn/Spring Habitat Purchase -** Any hibernaculum(a) purchased as part of conservation for Indiana bat winter habitat will include associated autumn swarming/spring staging habitat to the maximum extent practicable. Any purchase will be from a willing seller at fair market value. In addition, some parcels containing important autumn swarming/spring staging habitat may be acquired near key hibernacula regardless of whether the hibernacula are acquired themselves. Any acquired autumn swarming/spring staging habitat would be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. The purchase of forest would be included as part of the 3:1 mitigation in Measure B.3.
Status Report – To be completed.

SUMMER HABITAT

4. **Summer Habitat -** Investigations will be coordinated with the USFWS on purchasing lands at fair market value in the Action Area from "willing sellers" to preserve summer

habitat. Any acquired summer habitat area would be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.
Status Report – To be completed.

D. EDUCATION / RESEARCH / MONITORING

WINTER HABITAT

1. **Monitor Gated Caves -** All caves that have gates erected as mitigation for this project will have their temperature, humidity, bat activity and populations monitored before and for three years after gate installation. Infra-red video monitoring or other techniques deemed acceptable by USFWS will be conducted for a minimum of two nights in the appropriate season at each newly installed cave gate to ensure the bats are able to freely ingress and egress. Data acquisition will use a number of data loggers minimizing the need for entry into these caves. All precautionary measures will be taken to minimize potential impacts to hibernating Indiana bats.
   Status Report – To be completed.

2. **Cave Warning Signs -** Where deemed appropriate by USFWS, the following may be done: signs will be posted that warn the public and discourage cave entry at hibernacula within/near the Action Area. Signs should be placed so that they do not block air flow into the cave and do not draw attention to the entrance and attract violators (USFWS 1999). Also, light-sensitive data loggers may be placed within the caves to assess the effectiveness of the warning signs at deterring unauthorized entries. Permission from the landowners must be obtained before erecting such signs and installing data loggers.
   Status Report – To be completed.

3. **Biennial Census –** Total funding of $50,000 will be provided to supplement the biennial winter census of hibernacula within/near the proposed Action Areas. Funding will be made available in consultation with the USFWS.
   Status Report – To be completed.

AUTUMN/SPRING HABITAT

4. **Autumn/Spring Habitat Research -** Total funding of $125,000 will be provided for research on the relationship between quality autumn/spring habitat near hibernacula and hibernacula use within/near the Action Area. This research should include methods attempting to track bats at longer distances such as aerial telemetry or a sufficient ground workforce. A research work plan will be developed in consultation with the USFWS. Funding will be made available as soon as practical after Notice to Proceed is given to the construction contractor for the applicable Tier 2 Section (or earlier).
   Status Report – To be completed.

SUMMER HABITAT

5. **Mist Netting -** A work plan for surveying, monitoring, and reporting will be developed and conducted in consultation with and approved by USFWS. This mist netting effort will be beyond the Tier 2 sampling requirements. Fifty mist netting sampling sites are anticipated. Monitoring surveys focused at each of the 13 known maternity colonies will

be completed the summer before construction begins in a given section and will continue each subsequent summer during the construction phase and for at least five summers after construction has been completed. If Indiana bats are captured, radio transmitters will be used in an attempt to locate roost trees, and multiple emergence counts will be made at each located roost tree. These monitoring efforts will be documented and summarized within an annual report prepared for the Service.
Status Report – To be completed.

GENERAL

6. **Educational Poster** - Total funding of $25,000 will be provided for the creation of an educational poster or exhibit and/or other educational outreach media to inform the public about the presence and protection of bats, particularly the Indiana bat. Funding would be provided after a Notice to Proceed is issued for construction of the first section of the project.
   Status Report – To be completed.

7. **Rest Areas** - Rest areas will be designed with displays to educate the public on the presence and protection of sensitive species and habitats. Attractive displays near picnic areas and buildings will serve to raise public awareness as they utilize the Interstate. Information on the life history of the Indiana bat, protecting karst, and protecting water quality will be included in such displays.
   Status Report – To be completed.

8. **Access to Patoka NWR** - If reasonable, an interchange will be constructed that would provide access to a potential Visitor's Center at the Patoka River National Wildlife Refuge.
   Status Report – To be completed. At this time, there are two interchanges proposed near the Patoka River National Wildlife Refuge. South of the river, an interchange is proposed at SR 64 near Oakland City. North of the river, an interchange is being considered at Division Road as connected to SR 57. At either of these interchanges, signage and access for the refuge could be made available.

9. **GIS Information** - GIS maps and databases developed and compiled for use in proposed I-69 planning will be made available to the public. This data provides information that can be used to determine suitable habitats, as well as highlight other environmental concerns in local, county, and regional planning. Digital data and on-line maps are being made available from a server accessed on the IGS website at IU: http://igs.indiana.edu/arcims/statewide/index.html. In addition, detailed GIS forest data (five meter resolution) has been developed for the 13 maternity colony foraging areas (circles with 2.5 mile radius) and WAA. This data was developed in order to better determine habitat impacts to the Indiana bat. This is the most accurate and detailed forest data known to exist for those areas. This data could potentially be used by USFWS, other government agencies, or students to examine effects on the Indiana bat, other species, or ecosystems over time.
   Status Report – To be completed.

BALD EAGLE (*Haliaeetus leucocephalus*)

A. CONTEXT SENSITIVE SOLUTIONS

1. **Alignment Planning -** Where reasonable, Tier 1 has located Interstate alignments away from environmentally sensitive areas (nests, core forests, wetlands, etc.). INDOT will closely coordinate with Indiana DNR biologists regarding the locations of nests near and within the Action Area. Alignments will be shifted away from eagle nests when feasible.

2. **Medians and Alignments –** Variable-width medians and Independent Alignments will be used where appropriate to minimize impacts to some habitats and provide context sensitive solutions where possible. This may involve vertical and horizontal shifts in the north-south bound highways.

3. **Carrion Removal –** Standard operating procedures will be employed to remove carrion from the Interstate in a timely manner to reduce the potential for vehicle/eagle collisions. Appropriate INDOT Maintenance Units in Districts where proposed I-69 crosses or comes near to the Patoka River, East Fork of the White River, and West Fork of the White River will be given notice for special attention to this measure, especially in winter.

4. **Water Quality -** Water contamination will be avoided/minimized by the following:

    a. **Equipment Service -** Equipment servicing and maintenance areas will be designated to areas away from streambeds.
    b. **Equipment Maintenance -** Construction equipment will be maintained in proper mechanical condition.
    c. **Spill Prevention/Containment –** The design for the roadway will include appropriate measures for spill prevention/containment.
    d. **Herbicide Use Plan -** The use of herbicides will be minimized in environmentally sensitive areas, such as riparian areas that are protective of bald eagles and their prey.
    e. **Revegetation -** Revegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be utilized beyond the clear zone. Revegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers, as appropriate, similar to the native seed mixes of other nearby states.
    f. **Bridge Design –** Where feasible and appropriate, bridges will be designed with none or a minimum number of in-span drains. To the extent possible, the water flow will be directed towards the ends of the bridge and to the riprap drainage turnouts.

5. **Erosion Control -** Temporary erosion control devices will be used to minimize sediment and debris. Timely revegetation after soil disturbance will be implemented and monitored. Revegetation will consider site specific needs for water and karst. Erosion control measures will be put in place as a first step in construction and maintained throughout construction.

6. **Parking and Turning Areas -** Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing, and will avoid environmentally sensitive areas, such as karst.

7. **Tree Clearing -** Tree clearing will be kept to a minimum beyond the construction limits, but within the right-of-way.

8. **Floodplains –** Where reasonable and appropriate, floodplains and oxbows will be bridged to protect environmentally sensitive areas. The Patoka River floodplain will be bridged in its entirety, thus minimizing impacts to many different habitats.

9. **Vegetative Screens –** Where feasible and appropriate, a vegetative screen (i.e., trees) will be maintained within INDOT owned R/W between any nearby eagle nests and the Interstate to minimize visual and auditory disturbances during and after construction.

B. RESTORATION / REPLACEMENT

1. **Forest and Wetland Mitigation -** Wetland and forestland impacted by the project will be mitigated as part of the Forest and Wetland Mitigation Plan. Potential mitigation sites include areas near the Patoka River bottoms, Beanblossom Bottoms, East Fork of the White River, White River (Elnora), White River (Gosport), White River (Blue Bluff), and possibly others.

2. **Wetland MOU -** Wetlands will be mitigated at ratios agreed on in the Wetland MOU (dated January 28, 1991). Upland forests will be mitigated at a 3:1 ratio. Wetland replacement ratios are as follows:
    - **e.** farmed 1 to 1
    - **f.** scrub / shrub and palustrine / lacustrine emergent 2 - 3 to 1 depending upon quality
    - **g.** bottomland hardwood forest 3 – 4 to 1 depending upon quality
    - **h.** exceptional, unique, critical (i.e. cypress swamps) 4 and above to 1 depending upon quality.
3. **Forest Mitigation** - The Tier 1 Forest and Wetland Mitigation and Enhancement Plan identifies the general location of potential mitigation sites for upland and bottomland forests. Preference will be given to areas contiguous to large forested tracts that have recorded federal and state listed species. The actual mitigation sites implemented will be determined in or following Tier 2 in consultation with the Service and other environmental review agencies. Coordination with environmental review agencies will assure that these forest mitigation sites are strategically situated in biologically attractive ecosystems. Forest impacts will be mitigated at a ratio of 3 to 1. Where, tree planting is part of forest mitigation near large water bodies and rivers, native tree species that form large, open-branched crowns (e.g., eastern cottonwood and sycamore) will be included in the species mix. Tree plantings will be monitored for 5 years to ensure successful establishment. Mitigation lands will be protected in perpetuity via conservation easements.

4. **Platforms and Perches -** Mitigation sites will be evaluated for inclusion of nesting platforms and artificial perch sites.

C. CONSERVATION / PRESERVATION

Habitat Purchase - Purchasing lands in the Action Area from "willing sellers" to preserve habitat will be investigated. The listed areas and possibly others will be investigated for purchase and conservation. Special interest will be given to the Patoka River bottoms, East Fork of the White River, and Lake Monroe. Any acquired habitat would be turned over to the appropriate government conservation and management agency for protection in perpetuity via conservation easements.

D. EDUCATION / RESEARCH

1. **Pamphlet –** Total funding of $25,000 will be provided for the creation of an educational pamphlet and/or other educational materials to inform the public about the recovery, presence, and protection of bald eagles, including measures to reduce harm, harassment risks, and water quality.

2. **Rest Areas -** Rest areas will be designed to educate the public on the presence and protection of sensitive species and habitats. Attractive displays near picnic areas and buildings will serve to raise public awareness as they utilize the Interstate. Information on life history of the bald eagle, recovery in Indiana, protecting water quality, and limiting disturbance will be included in such displays.

3. **Visitor's Center -** If reasonable, an interchange will be constructed that provides access to a proposed Visitor's Center at Patoka River NWR.

4. **GIS Information -** GIS maps and databases developed and compiled for use in proposed I-69 planning will be made available to the public. This data provides information that can be used to determine suitable habitats for the bald eagle, as well as highlight other environmental concerns in local, county, and regional planning. Digital data and on-line maps are being made available from a server accessed on the Indiana Geological Survey (IGS) website at Indiana University: http://igs.indiana.edu/arcims/statewide/index.html.

Proposed Project Schedule

It is anticipated that Final Environmental Impact Statements (FEIS) will be completed for all six (6) of the Tier 2 Sections in 2007. Construction on the most southern 2 miles of the project is anticipated to begin in 2008.

INDOT is currently considering the possibility of constructing I-69 as a Public Private Partnership (P-3), which would include tolling to generate revenue for the facility. Under this type of funding mechanism, the entire length (140 miles), excluding the most southern 2 miles, could be included in a single contract. INDOT is anticipating initiating the procurement process in fall 2006 for this contract. When finalized, the contractor/concessionaire would then be responsible for the completion of the design and construction of all 140 miles within a specified timeframe (perhaps as quickly as 5 years), although there may not be any restrictions on where construction would be initiated, or in any specified geographic order. Specific requirements of the contract with the concessionaire, which may include timing details, would be developed by INDOT, but are not available for the Service's review at this time.

Changes Since the Tier 1 Biological Assessment

I-69 as a Toll Road

It is uncertain at this time if the proposed I-69 extension from Evansville to Indianapolis will be a toll road. The option of a toll road has recently been studied as a re-evaluation of the Tier 1 Environmental Impact Statement (EIS). This re-evaluation studied Alternatives 1, 2C, 3C, 4B, and 4C from the Tier 1 EIS. It involved a reassessment of performance measures and a re-evaluation of environmental impacts and resulted in a Tier 1 EIS Re-evaluation Report. In addition, each Tier 2 study will study both toll and non-toll funding options for their alternatives carried forward for detailed study in each of the six Tier 2 DEISs.

The following assumptions have been made regarding the tolling studies:

1. At this time, each Tier 2 Section is evaluating each alternative as a toll road and a non-toll road.
2. The future year (2030) traffic forecasts for I-69 as a toll road are anticipated to be approximately 30% to 50% lower than for I-69 as a non-toll road. Therefore, as a result of reduced traffic volumes on the toll options of the alternatives, the typical sections or along the corridor may be reduced. For Sections 1 through 4, it is reasonable to expect that there will be minimal changes to the configuration and footprint of the alignment alternatives for the toll option (the Interstate would be four lanes – two in each direction – as a toll road or as a non-toll road). For Sections 5 and 6, it is expected that there will be changes to the footprint and configuration of the alignment alternatives for the toll option — likely a reduction in the number of lanes.
3. A fully electronic toll collection system (possibly, transponder and video) would be utilized for the toll options. Because there would be no need for toll plazas, there should be little or no impact to the footprint of the roadway for incorporation of the electronic system on the mainline and ramps. In addition, interchange locations currently being considered as part of the alternatives carried forward will continue to be analyzed for the toll options because of electronic system and Tier 1 goals of economic development and accessibility.
4. Traffic and revenue analysis are currently being conducted. While the I-69 traffic volumes are expected to be lower, the affects on the local road system are unknown at this time. Nonetheless, traffic volumes on existing roads that parallel I-69 are expected to increase, while traffic on connections from I-69 to these north/south parallel roads may increase or decrease. Local road impacts will be evaluated as they relate to evaluation of the alternatives.
5. In the Tier 2 DEIS for each section, it is anticipated that a preferred location alternative will be identified. A preferred financing option (toll or non-toll) will be identified in the Tier 2 DEIS or Tier 2 FEIS for each section.

Community Planning Program

The I-69 Community Planning Program was not included in the original Tier 1 BA. The I-69 Community Planning Program is intended to establish a regional strategy for providing resources to local communities to manage development growth associated with I-69. The program would provide grants for local communities (cities, towns and counties) to prepare local land use plans to stimulate economic growth and manage new developments along the I-69 corridor. The local communities will be able to use these grants to prepare transportation land use plans, zoning and subdivision ordinances and special highway corridor "overlay zones" for development controls. The program will have the following objectives:

1. Develop regional strategies and resources to allow communities to achieve their desired vision of how that community will develop in the future.
2. Provide resources to establish a local planning process for communities to develop a desired future plan.
3. Develop protective strategies for environmentally sensitive areas (including karst and wetlands).
4. Develop growth management procedures to control development in accordance with local plans.
5. Develop economic development strategies consistent with the communities' plans.
6. Provide resources for local communities to implement growth management to achieve their plan.

This program is intended to empower local communities to take the initiative in planning for their future and implement controls to stimulate and manage growth. The I-69 Community Planning Program is a two-phase effort. Phase 1 provides for a regional planning assessment and development of regional planning strategies and resources for the entire I-69 corridor impact area. Phase 1 will include:

1. Establish a planning partnership with the Indiana Department of Commerce, the Indiana Land Resources Council, the Indiana Department of Natural Resources and corridor communities to provide oversight to the planning study.
2. Inventory of existing planning procedures in corridor communities (cities, towns and counties).
3. Review of State regulations and legislation affecting rural growth management procedures.
4. Identification of planning needs to manage corridor growth impacts.
5. Development of corridor strategies for economic development and effective planning.
6. Preparation of prototype planning process and model ordinances for zoning and subdivision ordinances and special highway corridor "overlay zones" for development controls.
7. Identification of environmentally sensitive areas warranting special protection.
8. Identification of farmland preservation strategies.
9. Conduct workshops for communities within corridor.

10. Provide technical planning support to corridor communities and assist communities in developing work programs to carry out Phase 2 work activities.

Phase 2 would provide for the actual planning grants to local communities for preparation of local plans and growth management ordinances. These grants would be up to $50,000 (actual amount to be refined based upon planning needs assessment in Phase 1). This would provide for the following elements:

1. Public involvement activities for plan preparation.
2. Develop comprehensive planning framework and corridor land use plan.
3. Develop economic development strategies.
4. Modify model planning ordinances to implement growth management controls.
5. Develop plan implementation program.

INDOT has just completed the contracting phase for the Phase 1 activities that will include developing community planning tools, development of regional planning and economic development strategies for the entire I-69 corridor area and establishing the framework for the Phase 2 program. This first phase accounts for $500,000 of the overall $2,000,000 for the I-69 Community Planning Program.

It is anticipated the Phase 1 program will take 12 to 16 months to complete (including time to prepare for the Phase 2 program). The Phase 2 program will provide for grants up to $50,000 for communities to develop planning programs to capture the economic benefits and manage associated growth resulting from the I-69 highway development (These grants will total $1,500,000). Cities and towns eligible for grants are: Bedford, Bloomfield, Bloomington, Ellettsville, Evansville, Greenwood, Indianapolis, Linton, Loogootee, Martinsville, Mooresville, Oakland City, Petersburg, Princeton, Spencer, Vincennes, and Washington. Counties eligible for grants are: Daviess, Dubois, Gibson, Greene, Johnson, Knox, Lawrence, Martin, Monroe, Morgan, Owen, Pike, Vanderburgh, and Warrick.

Eastern Greene County (County Line) Interchange

INDOT is considering an interchange in far eastern Greene County along the Greene and Monroe County line in Section 4. This interchange would include a 1-mile long connector road to SR 45, which would be developed with limited access right-of-way to preclude development along it. In the original Tier 1 studies, there was no interchange proposed at this location. Rather, one was proposed at SR 54 to the south in Greene County. According to INDOT, traffic volumes and community interest have prompted the investigation of an interchange location change north and east towards Monroe County. This location is in a karst area as was the original SR 54 interchange location. A Conservation Measure developed and included in the original Tier 1 BA stated “Efforts have been made to limit interchanges in karst areas, thereby limiting access and discouraging secondary growth and impacts. In Tier 2, further consideration will be given to limiting the location and number of interchanges in karst areas.” Information on the potential impacts and changes in traffic in the vicinity of hibernacula as a result of this newly proposed interchange are discussed in further detail beginning on page 88 of the BA Addendum. If an interchange is built along the county line, then an interchange would not be built at SR 54.

Rest Areas
Rest area locations for the proposed I-69 were not included as part of the proposed action in the original Tier 1 BA. The number of rest areas and their locations has not yet been determined. There will be as few as zero (0) or as many as three (3) rest area locations as part of this project. Rest area locations could be a single facility to service both north and south bound traffic, or twin facilities on either side of the Interstate. Rest area locations and impacts will be identified in Tier 2 BAs. Rest areas will be located to minimize forest impacts. Rest areas will not be located within the 13 Indiana bat maternity colony foraging areas (2.5 mile radius circle) or within the WAA.

Revised Forest Data
Three (3) different forest data sources were used in the BA Addendum. The goal was to use the most detailed and accurate data source where available. Figure 3 in the Addendum shows which forest data sources were used for each area analyzed.

Tier 1 Forest - In the original Tier 1 BA, forest impacts were estimated using United States Geological Survey (USGS) Land Cover Geographic Information Systems (GIS) data. This data is a subset of the National Land Cover Data (NLCD). The NLCD was developed by the USGS with the United States Environmental Protection Agency (USEPA) to produce a consistent, land cover data layer for the continental U.S. The land cover layer is based on satellite imagery with 30-meter resolution. This data is current through 1992. The Tier 1 forest data was used for analysis for portions of the SAA that are outside the I-69 corridor and outside the maternity colony foraging areas and WAA.

Tier 2 Forest - Tier 2 forest data for each of the six (6) sections was used in the analysis for areas within the I-69 corridor or where the representative alignment went outside the I-69 corridor. This data was not used for the 13 maternity colony foraging areas and the WAA; tree cover data was used for the analysis of those areas, as described below. Tier 2 forest data was created through photo interpretation of 2003 aerial photographs supplemented by field reconnaissance. It includes groups of trees larger than 1 acre and wider than 120 feet. This forest data was only developed for the I-69 corridor, or areas where the representative alignment crossed outside the corridor. **All forest impacts and mitigation acreages used in this revised Tier 1 BO for this project were calculated using Tier 2 forest data.**

Tree Cover - A finer scale, more detailed tree cover data layer was developed for the maternity colony and WAA analysis conducted in this document. The tree cover data layer was developed for each maternity colony foraging area (2.5-mile radius circle) and the WAA using Image Analysis for ArcView 3.0 (Leica Geosystems) software. It is based off the 2003 National Agricultural Imagery Program (NAIP) true color aerial photographs and is 5-meter resolution. It is considerably more detailed than the data used in the original Tier 1 BA.

Representative Alignments
In the original Tier 1 BA, a working alignment was used to estimate forest impacts, as well as other types of impacts. This working alignment ranged from 270 feet to 470 feet wide depending on terrain, number of expected lanes, and number of expected frontage roads. It also included a 500-foot radius buffer at potential interchange locations. It was expected these interchange locations could change in Tier 2. The working alignment was located in the approximate center of the corridor.

For the analysis in this document, "representative" alignments will be used. For the purposes of this study, a representative alignment is the footprint for the alternative with the largest Tier 2 forest impacts, among those alternatives that were under study as of November 14, 2005. Tier 2 forest impacts were determined using 2003 aerial photographs, high resolution aerial photographs for the corridor, and field reconnaissance. This data was analyzed using Geographic Information System (GIS) software. The representative alignment may or may not end up being the preferred alternative. The representative alignment is expected to have higher forest loss than the preferred alternative due to efforts to further minimize forest impacts. In some instances, particularly for interchanges or connector roads, the alignment may extend outside the Tier 1 corridor. Table 3 shows the impacts on Tier 2 forest for the representative alignments in each Section.

Table 3. Representative Alignment Impacts on Tier 2 Forest

Section	Representative Alignment Impacts on Tier 2 Forest
1	55 acres
2	280 acres
3	112 acres
4	1,132 acres
5	303 acres
6	266 acres
TOTAL	**2,148 acres**

New Indiana Bat Hibernacula

For the purposes of this BO, an Indiana bat hibernaculum was defined as any cave where an Indiana bat had been found hibernating. Due to the physical characteristics of the caves, some may have a greater significance to the species than others. At the time of the original Tier 1 BA, there were 10 known Indiana bat hibernacula considered to be within the I-69 Winter Action Area (WAA). These 10 caves were: Cave System (including Cave, Cave, and Cave), Cave, Cave, Cave, Cave, Cave, Cave, Cave, Cave, and Cave. Cave surveys conducted as part of the I-69 project have since identified three (3) previously unrecognized, small Indiana bat hibernacula in addition to the 10 hibernacula that were already known within five miles of the corridor. These three (3) caves are Cave, and A fourth hibernaculum, Cave, was identified within the WAA approximately five (5) miles from the I-69 corridor. It was confirmed as an Indiana bat hibernaculum by the USFWS and Dr. Virgil Brack in 2004 during a followup visit to the cave after receiving the initial report by members of the Indiana Karst Conservancy (IKC). Finally, as previously discussed, with the addition of Cave, there is a total of 15 Indiana bat hibernacula within the I-69 WAA.

Indiana Bat and Karst Surveys

Since the publication of the original Tier 1 BA, several studies relating to the Indiana bat and karst features have been completed. Mist netting surveys for each I-69 Section have been completed in the SAA in 2004, with additional surveys completed in 2005. The mist netting surveys also included radiotelemetry and roost tree emergence counts. Radiotelemetry involves temporarily affixing a lightweight radiotransmitter to a bat's back and attempting to track the tagged bat to its roost tree(s). Roost tree emergence counts were also conducted, which involved counting the number of bats that leave an identified roost tree to forage at dusk. Detailed summer habitat reports were prepared for each I-69 Section and provided to the Service. These reports contained detailed information for all summer survey work that was conducted in each section. They included survey results, forms, photographs, and maps. These reports are listed in the BA Addendum.

A cave reconnaissance was conducted within five (5) miles of the proposed corridor in portions of Monroe, Greene, and Lawrence Counties. The purpose of this reconnaissance was to identify and visit caves that represented potential winter hibernacula for the Indiana bat and make recommendations regarding further detailed investigations. The results of this study can be found in the report intitled *Winter Action Area: I-69 Evansville to Indianapolis Tier 2 Studies Cave Reconnaissance for Indiana Bat Hibernacula, October 2005*(Indiana Geological Survey)

Detailed autumn, winter, and spring habitat survey reports were prepared for Sections 4 and 5 (only Sections in karst area). These reports contained detailed information for all winter habitat survey work that was conducted in the two (2) sections. They included survey results, forms, photographs, and maps. These reports are listed below.

2005: Autumn, Winter, and Spring Habitat for the Indiana Bat (*Myotis sodalis*) within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana, September 7, 2005 (Environmental Solutions & Innovations, Inc.)

Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana, 2005. (BHE Environmental, Inc.)
2006: Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana 2006, January 2006. (BHE Environmental, Inc.)

Autumn 2005 and Winter 2006 Habitat For the Indiana Bat (*Myotis sodalis*) within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana. (Environmental Solutions & Innovations, Inc.)

Action Areas

The proposed project involves the construction, operation, and maintenance of an Interstate highway, I-69, from Indianapolis to Evansville through southwestern Indiana. The "action area" is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. For Tier 1, the FHWA, INDOT, and the Service's BFO jointly developed two seasonally based action areas for the Indiana bat and one for the bald eagle as is described in the following subsections. The Action Areas may be to be expanded or otherwise refined in subsequent Tier 2 BAs as the anticipated reach of direct and indirect effects of each section of I-69 are more clearly recognized and understood.

Indiana Bat Action Areas

Because the full "reach" of the direct and indirect effects of this project were not well defined in Tier 1, we assumed quantifiable effects to Indiana bats would be confined to the project footprint and a 2.5-mile buffer in all directions. Therefore, the "**Summer Action Area**" (SAA) for the Indiana bat has been generally defined as a 5-mile band, 2.5 miles either side of the centerline of Alternative 3C, that runs the entire length of the proposed project (Figures 3 and 4). The 2.5-mile distance also has biological significance, because a study in Illinois (Gardner et al.1991a) found that the maximum distance an Indiana bat traveled from its daytime roost tree to its original capture site was 2.5 miles (4.1 km). This 2.5-mile distance also is consistent with unpublished data from Indiana bat studies conducted at the Jefferson Proving Grounds and the Indianapolis Airport in Indiana (Pruitt 1995, 3D/International 1995). The entire length of the proposed project contains suitable summer roosting and foraging habitat, thus a SAA width of 2.5 miles on either side of the proposed centerline (5 miles wide) will encompass summer habitat being used by Indiana bats that might be affected by the proposed I-69 project. The Tier 1 corridor is approximately 2000 feet wide in most places, but is narrowed in some instances to avoid sensitive environmental areas.

A 2.5-mile radius circle has also been centered on each of the 13 Indiana bat maternity colony activity areas discovered during the Tier 2 mist net surveys. At these 13 locations the 2.5-mile radius circles typically extend beyond the limits of the standard SAA (Figures 3 and 4).

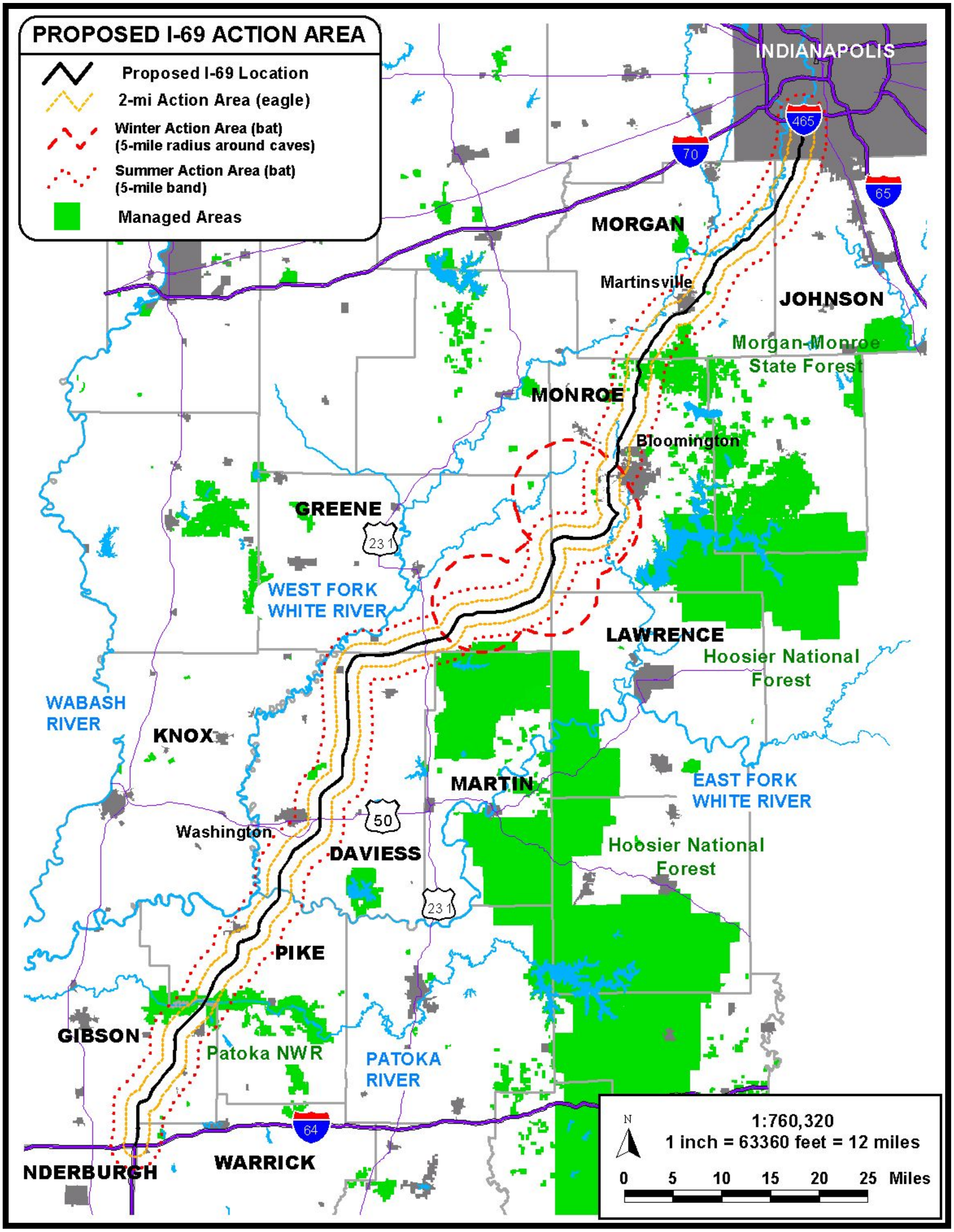

Figure 3. Original I-69 Action Areas for the Indiana bat and bald eagle.

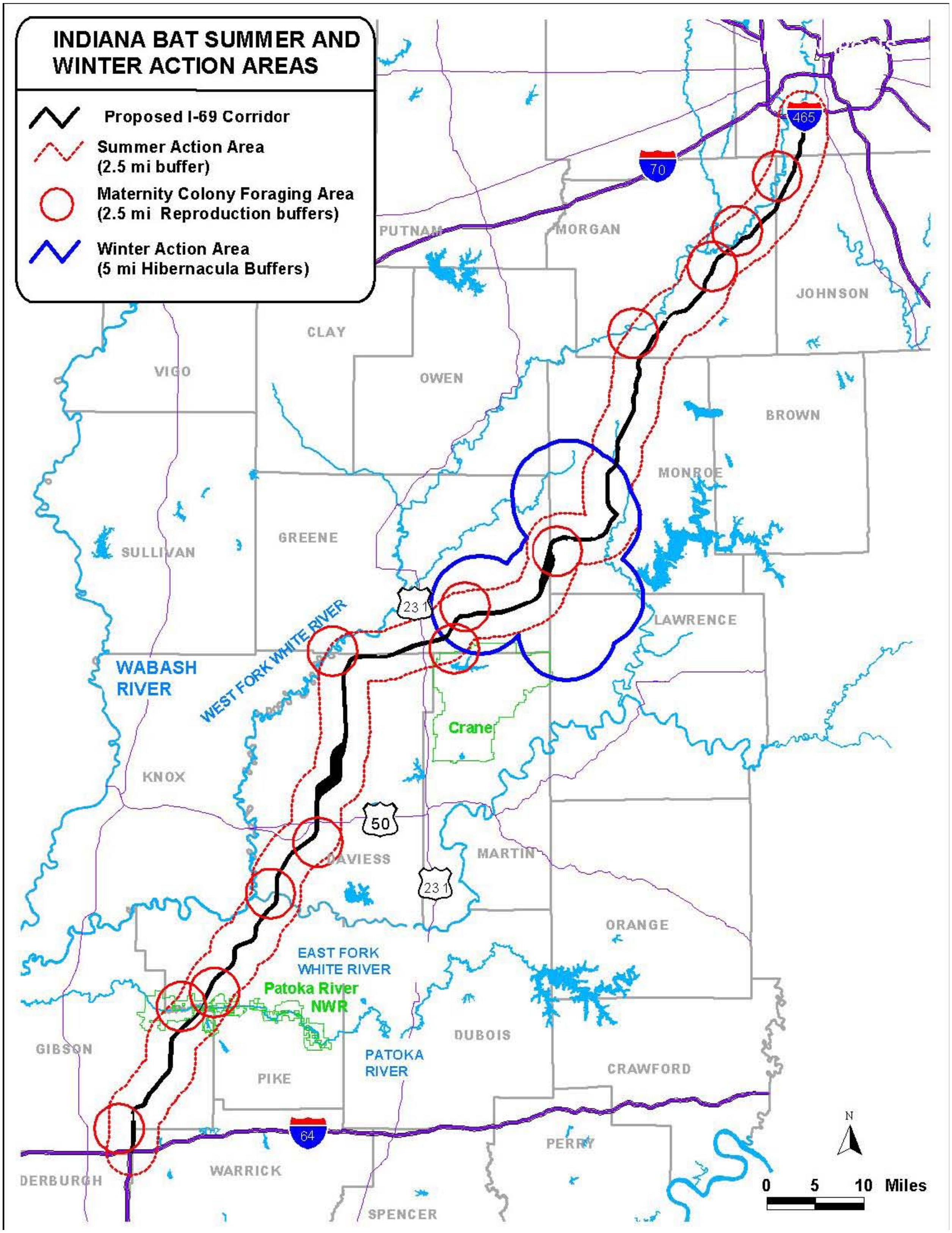

Figure 4. Revised I-69 Indiana Bat Summer and Winter Action Areas (Excluding and Cave).

Similarly, the Service expanded the action area by defining the "**Winter Action Area**" (WAA) for Indiana bats as collectively being the total area that falls within a 5-mile radius centered on each of the known Indiana bat hibernacula that have entrances located within 5 miles of the proposed 3C corridor (Figures 3 and 4) because indirect effects to swarming bats could reach that distance. [**NOTE**: The BFO expounded upon the definition of the WAA that was in the Tier 1 BA to add clarity and to allow for the possibility of further modifications that may be warranted based on new information collected during Tier 2 studies]. The circular areas that form the WAA are assumed to encompass 1) all of the known cave entrances and connected subterranean passages of each hibernaculum, 2) the majority of the recharge areas (e.g., sinkholes, and sinking stream basins) of cave streams that run through or are otherwise hydrologically connected to each hibernaculum (if known), and 3) the majority of the above-ground habitat used by Indiana bats while foraging and roosting during the fall swarming and early spring staging periods (e.g., forests, open woodlots, tree-lined fencerows, pastures, old fields, wetlands, and surface waters). The Tier 1 BA Addendum included 14 known Indiana bat hibernacula within the WAA, which are all natural caves located in the Crawford Upland and Mitchell Plateau physiographic regions in western Monroe and eastern Greene counties. The 5-mile radius centered on a hibernaculum was chosen because Indiana bats have been documented roosting and foraging up to a maximum distance of approximately 5 miles (8 km) from their winter hibernacula during the fall swarming period (Rommé et al. 2002).

The original Tier 1 BO stated

> "there is no designated Critical Habitat for the Indiana bat within the Summer or WAAs for I-69. However, one hibernaculum (a natural cave) that has been designated as Critical Habitat for the Indiana bat is located approximately 6 miles from the proposed 3C corridor (i.e., 1 mile beyond the WAA) in eastern Greene County. During informal consultation with the Service's BFO and prior to the release of the Tier 1 DEIS, the FHWA and INDOT agreed to shift their preliminary alignment of Alternative 3 further away to avoid adverse affects to Indiana bats using this cave."

The cave in eastern Greene County that this statement was referring to is known as Cave, which was officially designated as Critical Habitat under the ESA on September 24, 1976. Subsequently, in the original Tier 1 BA and BO and again in the Tier1 BA Addendum, Cave was not considered to be within the WAA, because its main entrance was approximately 6 miles from the proposed corridor. However, through formal consultation and mapping provided by FHWA and INDOT in the Tier 1 BA Addendum, the Service realized that the cave's underground passage actually extended approximately one mile to the east and closer to the I-69 corridor. Furthermore, the BA Addendum showed that the beginning of one of the currently proposed, limited-access, connector roads between SR. 45 and the proposed countyline interchange in eastern Greene County would fall within 5 miles of the main entrance of Cave. Finally, Figures 19 and 21 in the BA Addendum revealed that I-69 would likely cause induced residential and business growth well within 5 miles of Cave. For these reasons, the Service now considers Cave to be within the I-69 WAA and has treated it as such in this revised BO. During a meeting on July 17, 2006, FHWA and INDOT agreed to this change and subsequently provided additional information regarding impacts to the area surrounding Cave.

With the exception of Cave, the Service has generally assumed no Indiana bats, their hibernacula and associated karst systems, their prey, or surrounding habitat will be directly or indirectly affected beyond 5 miles from the proposed footprint of I-69. However, if new information proves one or more of these assumptions are not valid, then the radii of all hibernacula will be adjusted accordingly or adjusted on a case-by-case basis, which ever is warranted and appropriate, during subsequent Tier 2 consultations. Likewise, if an additional Indiana bat hibernaculum(a) is discovered during ongoing Tier 2 investigations or future cave/mine surveys, then it will be treated similarly and given full consideration during project section-specific consultations with the Service as warranted.

Bald Eagle Action Area

The action area for the Federally threatened bald eagle is a band that includes 1 mile on either side of the proposed I-69 corridor (Figure 3). The Northern States Bald Eagle Recovery Plan, developed by the Service (USFWS 1983a), details three management zones, or buffer zones, that should be established around bald eagle nests to avoid disturbing the eagles. These buffer zones become less restrictive to human activity as the distance from the nest increases. The primary zone extends 330 feet from the nest, the secondary zone 660 feet, and the tertiary zone 1,320 feet (1/4 mile) to 2,640 feet (1/2 mile). The Bald Eagle Action Area was extended to 1 mile on either side of the proposed corridor, which is twice the distance of the standard tertiary zone, and four times the recommended distance from winter night roost sites. Therefore, the action area band is a total of approximately 2.4 miles wide, and follows the length of the proposed Interstate from Indianapolis to Evansville. No direct or indirect effects from I-69 are expected to occur on bald eagles beyond this distance. Because no Critical Habitat has been designated for the bald eagle, none will be adversely modified by this project.

The Service's Section 7 Consultation Approach

Because the FHWA is following a tiered process for the I-69 project, where complete and detailed information regarding specific alignments and anticipated impacts is not available for analysis until after the Tier 1 corridor decision has been finalized and Tier 2 studies and BAs have been completed on all six project sections, the Service believes that a programmatic consultation approach is appropriate for this project.

By taking a programmatic consultation approach, the Service will be able to complete one comprehensive and conservative effects analysis, up front in Tier 1 for the entire I-69 project rather than repeating the same analyses for each of the six subsequent Tier 2 Project Sections. Therefore this approach should also increase the efficiency of the section 7 consultation process for I-69. Another benefit of completing this analysis up front in an overall project or "programmatic" consultation document is that the anticipated effects common to each of the forthcoming Tier 2 Project Section alignments can be added into the environmental baseline prior to their actual completion. This provides predictability for the FHWA and INDOT as they can be assured that the effects of their future Tier 2, I-69-related actions have already been broadly accounted for.

In Tier 1, uncertainty exists as to the specific impacts that will occur when the specific alignments eventually are selected for the entire I-69 project. Therefore, the Service will provide the benefit of the doubt to the listed species and use "reasonable worst case" assumptions when developing the programmatic-level biological opinion. This approach results in the Service examining the greatest levels of impacts that can reasonably occur from implementing the conservation measures proposed in the Tier 1 BA. This evaluation is then refined through the Tier 2 Project Section-level consultations. This approach will ensure that the FHWA can fulfill its responsibilities under section

7(a)(2) of the Act to "insure" that actions implemented under their I-69 "program" are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated Critical Habitat.

The Service will implement an appended programmatic approach for I-69, which is a two-stage consultation process. The first stage involves the Service developing a programmatic biological opinion for I-69 that analyzes potential effects at a landscape-level, local population level, and individual animal level that may result from fully implementing the proposed design criteria developed for the entire I-69 project from Evansville to Indianapolis, Indiana. This stage was originally completed near the end of Tier 1 and is now being revisited during this reinitiation consultation after the completion of Tier 1 and after many Tier 2 studies have been completed. The second stage involves the FHWA developing appropriate project section-specific documentation (e.g., Tier 2 biological assessments for each project section) that addresses the specific impacts associated with each section's final alignment and funding option for I-69. Upon completion of the Service's project section-specific review and analysis, the associated documentation is physically "appended" to the programmatic biological opinion. The programmatic biological opinion, together with the appended documentation for each project section, encompasses the complete consultation document for each Tier 2 Project Section of I-69.

To insure the impacts of take associated with the final alignments chosen for each of the six forthcoming Tier 2 Project Sections of I-69 are appropriately minimized and that the exemption of incidental take is appropriately tracked and documented, the FHWA and the Service will implement an appended programmatic consultation approach for this project. Under this approach, the Service's Programmatic Biological Opinion and Incidental Take Statement for I-69 will consider and quantify reasonable amounts of anticipated incidental take for Indiana bats and bald eagles for the entire I-69 project from Evansville to Indianapolis during Tier 1. However, all impacts associated with each Tier 2 Project Section which have not yet been specifically identified and those which will impact Indiana bat or bald eagle habitat will be individually reviewed to determine if they are consistent with the Tier 1 programmatic Incidental Take Statement's reasonable and prudent measures and associated terms and conditions, and to ensure that once specific alignments are identified, the site-specific impacts of the resulting incidental take are minimized. If an individual Tier 2 Project Section is found to be consistent with the programmatic consultation it will be appended to the programmatic Biological Opinion and Incidental Take Statement, along with any project section-specific reasonable and prudent measures and terms and conditions that are needed to fulfill the requirements of section 7(a)(2). Details on how specific impacts associated with each Tier 2 Project Section will be reported and documented are included in the attached INCIDENTAL TAKE STATEMENT. No incidental take is exempted until after a Tier 2 Project Section's BA has been reviewed, found to be consistent with Tier 1, and has been appended to the programmatic BO by the Service.

II. STATUS OF THE SPECIES

Indiana Bat

This section is a discussion of the range-wide status of the Indiana bat and presents biological and ecological information relevant to formulating the biological opinion. It includes information on the species' life history, its habitat and distribution, and the effects of past human and natural factors that have led to the current status of the species.

The Indiana bat was officially listed as an endangered species on March 11, 1967 (Federal Register 32[48]:4001) under the Endangered Species Preservation Act of October 15, 1966 (80 Stat. 926; 16 U.S.C. 668aa[c]). The Endangered Species Act of 1973 extended full protection to the species. The Service has published a recovery plan (USFWS 1983b) which outlines recovery actions. Briefly, the objectives of the plan are to: (1) protect hibernacula; (2) maintain, protect, and restore summer maternity habitat; and (3) monitor population trends through winter censuses.

Thirteen winter hibernacula (11 caves and two mines) in six states were designated as Critical Habitat for the Indiana bat in 1976 (Federal Register, Volume 41, No. 187). In Indiana, two winter hibernacula, Cave in Crawford County and Cave in Greene County, were designated as Critical Habitat. Cave is within the reach of the proposed project and therefore is considered to be within the Winter Action Area for I-69.

Range-wide Population Status

Because the vast majority of Indiana bats form dense aggregations or "clusters" on the ceilings of a relatively small number of hibernacula (i.e., caves and mines) each winter, conducting standardized surveys of the hibernating bats is the most feasible and efficient means of estimating and tracking population and distribution trends across the species' range. Collectively, winter hibernacula surveys provide the Service with the best representation of the overall population status and relative distribution that is available.

For several reasons, interpretation of the census data must be made with some caution. First, winter survey data has traditionally been subdivided by state due to the nature of the data collection. As described below, each state does not represent a discrete population center. Nevertheless, the range-wide population status of the Indiana bat has been organized by state thus far. Second, as will be further discussed, available information specific to the "reproductive unit" (i.e., maternity colony) of the Indiana bat is limited. While winter distribution of the Indiana bat is well documented, little is known as to the size, location and number of maternity colonies for the Indiana bat. As described below, it is estimated that the locations of more than 90 percent of the estimated maternity colonies remain unknown.

Additionally, the relationship between wintering populations and summering populations is not clearly understood. For example, while it is known that individuals of a particular maternity colony come from one to many different hibernacula, the source (hibernacula) of most, if any, of the individuals in a maternity colony is not known. As discussed in the "Spring Emergence/Migration" section, Indiana bats have been documented to travel up to 300 miles from their hibernaculum to their maternity areas (Gardner and Cook 2002). As such, the origin of the bats (hibernacula) that comprise the maternity activity in the action area is unknown.

Rangewide Winter Hibernacula Surveys

The data regarding Indiana bat abundance prior to Federal listing are limited, but the information suggests that they were once far more abundant than they were in the 1960s. Tuttle and colleagues, for example, believe the overall abundance of Indiana bats likely rivaled that of the now extinct passenger pigeon (Tuttle et al. 2004). The basis for Tuttle's and others estimates of millions of

Indiana bats prior to European settlement is primarily based on historic accounts (e.g., Blatchley 1897, Silliman et al. 1851), extensive staining left on the ceilings of several historic hibernacula (Tuttle 1997, Tuttle 1999), and other paleontological evidence (Munson and Keith 1984, Toomey et al. 2002). For example, an analysis of bone deposits in [redacted] KY revealed that an estimated 300,000 Indiana bats died during a single flood event at some point in history (Hall 1962). Although we are never likely to know the true historical abundance of Indiana bats, it seems clear from the evidence above that Indiana bats were much more abundant than observed in 1960.

When the Indiana bat was originally listed as endangered in 1967, there were approximately 883,300 bats (Figure 5) and most of these hibernated in just a small number of hibernacula (Clawson 2002). Since it was listed the species' population numbers have apparently continued to decline until the past few survey years. Although some winter bat surveys began as early as the late 1950s, systematic surveys were not conducted across the range until the mid 1980s when there were an estimated 678,750 Indiana bats (Clawson 2002). Since being listed, large population declines have been observed, especially at hibernacula in Kentucky and Missouri. Caves in Kentucky suffered dramatic losses because of changes in microclimate due to poor cave gate design in two of the three most important hibernacula (Humphrey 1978), and Indiana bat numbers in Kentucky hibernacula had continued to decline until 2005 when a increase was first observed (King, personal communication 2005). Despite recovery efforts, Indiana bats in Missouri caves have continuously declined with a loss of more than 80 percent of the previous population size (Clawson 2002). From the 1960s/70s to the most recent population survey in 2005, the rangewide population of the Indiana bat has declined from approximately 883,300 Indiana bats for 1960/1970 to 458,333 in 2005, or approximately 52 percent. The ten-year population trend (from 1960 – 2000) of the Indiana bat has shown a steady decline (Figure 5).

The 2005 Indiana bat rangewide population estimate totaled approximately 457,374 bats; a 15% increase over the 2003 estimate of 398,220 bats (Andy King, USFWS, unpublished data 2005; Figure 6). In 2005, about 60% of the estimated 457,374 Indiana bats were hibernating in nine Priority 1 hibernacula in four states: 4 hibernacula in Indiana, 3 in Missouri, 2 in Kentucky and 1 in Illinois (A. King, USFWS, unpublished data, 2005). Priority 2 hibernacula are known from the aforementioned states, in addition to Arkansas, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. Priority 3 hibernacula have been reported in 21 states, including all of the aforementioned states (Figure 6).

Although a slight increase (4.5%) over the previous biennial rangewide population estimate first occurred in 2003, these results may not be statistically or biologically significant, and no determinations can be made with confidence from such a limited survey period. Small fluctuations from year-to-year may be attributed to such factors as weather affecting the success of reproduction for a given year (Humphrey and Cope 1977, Ransome 1990); therefore, it is not appropriate to extrapolate long-term trends from changes between individual survey periods. Nonetheless, it should also be noted that in 2005 there was almost a 15% increase over the 2003 estimate, but again it is premature to know with any confidence whether this is the beginning of a sustained positive trend or just an upward anomaly in an otherwise downward trend. Until more data becomes available in coming years, we are cautiously optimistic and encouraged by what initially appears to be a slowing in what otherwise has been a steep long-term decline.

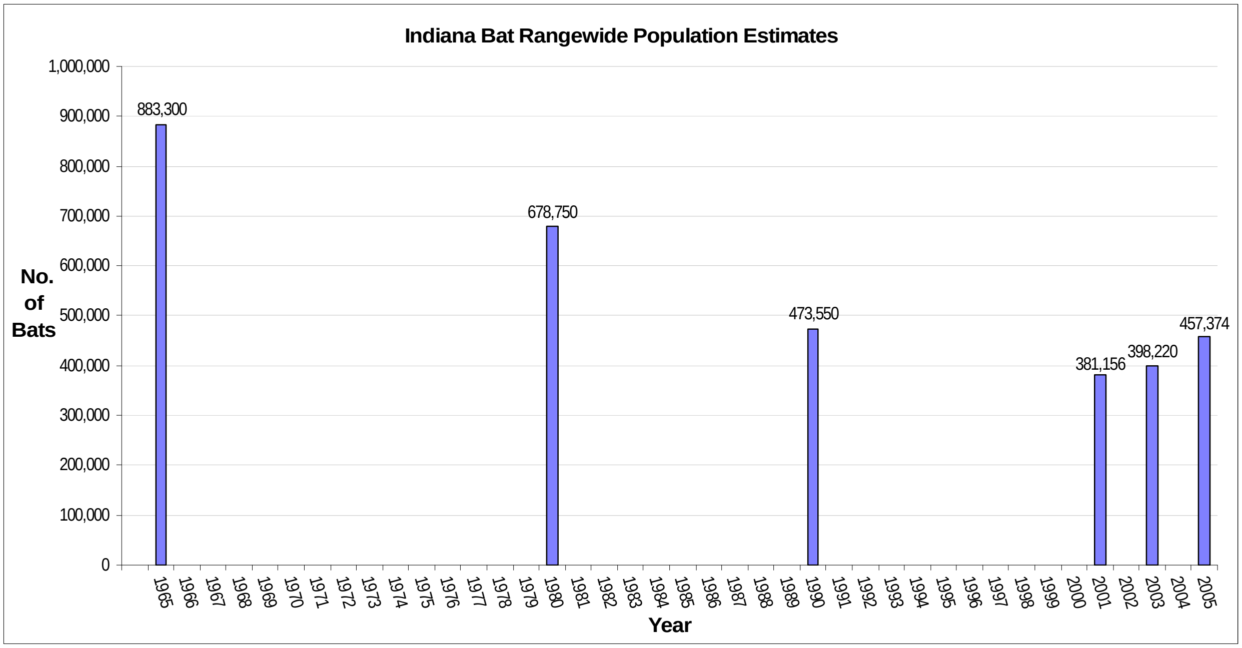

Figure 5. Indiana bat rangewide population estimates (Data sources: 1965-1990, Clawson 2002; 2001-2005, USFWS, unpublished data, 2006). Rangewide estimates calculated from all known hibernacula were not attempted or data was not available for most years prior to 2001.

Indiana	206,610
Missouri	65,104
Kentucky	62,380
Illinois	44,343
New York	41,702
West Virginia	12,677
Tennessee	9,971
Ohio	9,769
Arkansas	2,067
Pennsylvania	746
Virginia	735
New Jersey	652
Vermont	297
Alabama	296
Michigan	20
Oklahoma	5
Total	457,374

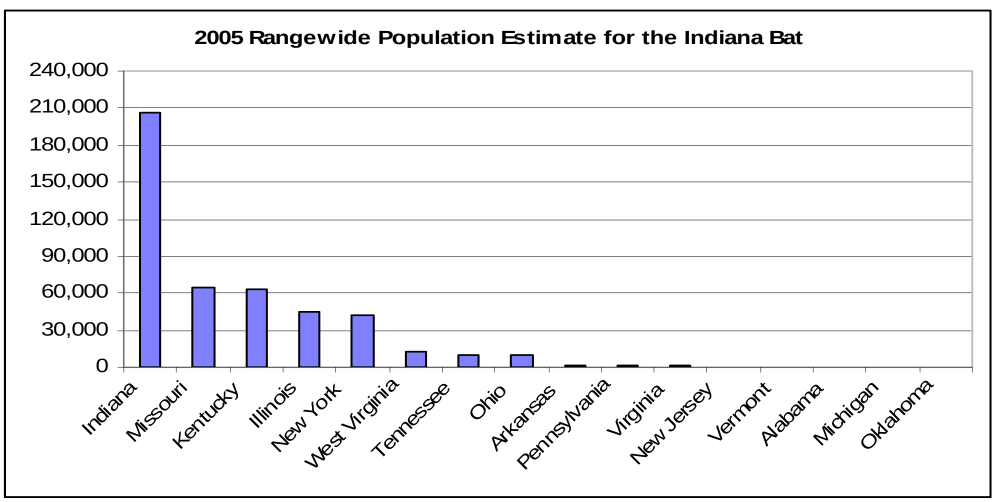

Figure 6. State-by-state results of the 2005 Indiana bat winter hibernacula surveys.

Some investigators believe that warmer winter temperatures may have resulted in less conducive microhabitat conditions (warmer temperatures) at hibernacula, particularly in the southern part of the species range (Rick Clawson, personal communication, Missouri Department of Conservation), but this has yet to be rigorously investigated. Other declines have occurred as winter hibernacula have flooded, hibernacula ceilings have collapsed, or cold temperatures kill bats through hypothermia. Exclusion of bats from hibernacula through blocking of entrances, installation of gates that do not allow for bat ingress and egress, disruption of cave air flow, and human disturbance during hibernation have been documented causes of Indiana bat declines. Because many known threats are associated with hibernation, protection of hibernacula still remains a top management and recovery priority. Although some hibernacula have been restored in order to support future wintering populations, Indiana bats have not returned to some of these hibernacula as anticipated while they have quickly recolonized others.

Despite the protection of most major hibernacula, population declines generally have continued until the apparent increases in 2003 and 2005. It is too early to tell whether these recent increases in the estimated population size are sustainable or simply a brief upward swing on an otherwise long-term decline. Continued population declines of Indiana bats, in spite of efforts to protect hibernacula, initially led some scientists to the conclusion that additional information on summer habitat is needed (Rommé et al. 1995), but others contend that the primary cause of continued declines stems from suboptimal microclimates within traditional hibernacula and/or high human disturbance levels (Tuttle and Kennedy 2002). In addition to increased focus on these issues, attention is also being directed to pesticide contamination. Insecticides have been known or suspected as the cause of a number of bat die-offs in North America, including endangered gray bats (*Myotis grisescens*) in Missouri (Clark et al. 1978). The insect diet and longevity of bats also exposes them to persistent organochlorine chemicals which may bioaccumulate in bat tissue and cause sub-lethal effects such as impaired reproduction.

Maternity Colonies

To date, most records of reproductively active female and juvenile Indiana bats have occurred in glaciated portions of the upper Midwest including southern Iowa, northern Missouri, most of Illinois, most of Indiana, southern Michigan, and western Ohio (Gardner and Cook, 2002, USFWS unpubl. data). The first maternity colony was found in east-central Indiana in 1971 and most subsequent surveys and studies of Indiana bat maternity habitat have been conducted in the upper Midwest (Cope et al. 1974, Clawson 2002). Unglaciated portions of the Midwest (southern Missouri, parts of southern Illinois, and south-central Indiana), Kentucky, and most of the eastern and southern portions of the species' range appear to have fewer maternity colonies per unit area of forest than does the upper Midwest. Increased summer survey efforts are needed elsewhere in the range, however, before final conclusions may be reached regarding relative abundance across the species' summer range.

Recently, multiple maternity colonies have been discovered in the Champlain Valley and lower elevations of adjacent hills between Burlington, Vermont, and Ticonderoga, New York (A. Hicks, pers. comm., September 2005). In contrast, the first maternity roosts in "the South" recently were found in very different types of habitat, in areas of extensive mature forest in the southern Appalachian Mountains of North Carolina and Tennessee. In further contrast, these colonies were found roosting in eastern hemlock (*Tsuga canadensis*) and pines (*Pinus* spp.), rather than deciduous trees (Harvey 2002).

Based on published literature and correspondence with Service and state biologists throughout the range of the Indiana bat, maternity activity has been documented at approximately 250 locations throughout the species' range and colonies are still considered extant at approximately 246 of these locations(Table 4) (USFWS, unpublished data, 2006). The majority of confirmed

Table 4. States and counties with recorded Indiana bat maternity colonies.[1,2,3]

State	No. of Recorded Maternity Colonies	Counties with Recorded Maternity Colonies (if multiple colonies, then # is shown)
Arkansas	1	Clay
Illinois	13	Adams (2), Alexander, Henderson, Jackson (3), Jersey, Pike (2), Pulaski, Saline, and Schuyler
Indiana	83	Bartholomew (3), Clinton (2), Crawford, Davies (2), Dearborn, Gibson (2), Greene (3), Hendricks (2), Henry, Howard, Huntington, Jackson (3), Jasper, Jay, Jefferson (2), Jennings (2), Johnson (3), Knox, Koskiusko, LaPorte (2), Marion, Martin, Monroe (2), Montgomery (3), Morgan (4), Newton, Parke (2), Perry (2), Pike (2), Posey, Pulaski (2), Putnam (2), Randolph (3), Ripley (2), Rush, Shelby (2), Spencer, St. Joseph, Steuben, Tippecanoe (4), Vermillion, Vigo, Wabash (2), Warren (2), Warrick (2), Wayne, and Wells
Iowa	26	Appanoose (2), Davis, Decatur (2), Des Moines, Iowa, Jasper, Keokuk, Lucas (2), Madison (2), Marion (7), Monroe, Ringgold, Van Buren, Wapello, and Washington (2)
Kentucky	32	Ballard, Ballard/Carlisle, Bath (3), Breckinridge, Bullitt (4), Daviess, Edmonson (3), Floyd, Harlan (3), Henderson (2), Hickman (2), Jefferson (3), Logan, McCracken (2), Pulaski, Rowan, Spencer, and Union
Maryland	2	Carroll (2)
Michigan	11	Calhoun, Cass, Eaton, Hillsdale, Jackson, Lenawee (2), Livingston, St. Joseph (2), and Van Buren
Missouri	20	Chariton, Gasconade, Iron, Jefferson, Knox (2), Lewis, Linn, Macon, Madison, Marion, Mercer, Monroe, Nodaway, Pulaski, Scotland, St. Francois, St. Genevieve, Sullivan, and Wayne
New Jersey	2	Morris (2)
New York	34	Cayuga, Dutchess (5), Essex, Jefferson (8), Onandaga (4), Orange (8), and Oswego (7)
Ohio	10	Ashtabula, Butler, Clermont, Cuyahoga, Greene, Hocking, Lawrence, Paulding, Summit, and Wayne
Pennsylvania	2	Berk and Blair
Tennessee	2	Blount and Monroe
Vermont	4	Addison (4)
Virginia	1	Lee
West Virginia	3	Boone (2) and Tucker
Total	**246**	

[1] Unpublished data obtained in response to a data request sent to FWS Field Offices in February 2006.
[2] Most maternity colony records were based upon the capture of reproductively active females and/or juveniles between 15 May and 15 August.
[3] This table includes records of maternity colonies considered to still be locally extant. Although some additional records exist, we opted not to include them, if subsequent surveys failed to detect their presence (i.e., the colony may have disbanded, relocated, was extirpated, or was present but not found).

maternity areas are in the "core" of the range, in the glaciated Midwest in pockets of remaining forested habitat within a predominantly agricultural landscape and in the Northeast (i.e., NY and VT). Because the Indiana bat is philopatric (i.e., loyal to its traditional summering area), there is currently no evidence to suggest that all maternity colonies are located in optimal foraging and roosting habitat. A possibility that may have contributed to the species' decline is that many existing maternity colonies are senescent (i.e., deaths outnumber births) or are population sinks.

This could be caused by pups being produced but not surviving their first hibernation period; or maternity areas are no longer providing a sufficient supply of suitable prey, resulting in an increase in the age of first reproduction and increasing fecundity schedules. Proof of at least several years of successful reproduction and recruitment would be needed to verify long-term survival of the Indiana bat in these highly altered and fragmented landscapes. Although data at a few maternity sites indicate that reproduction is occurring (exit counts nearly double a month after birth), long-term monitoring of maternity sites is limited. Long-term monitoring has been conducted at a maternity colony located near the Indianapolis Airport (Whitaker and Sparks 2003, Whitaker et al. 2004). This colony continues to persist, and shows evidence of reproduction, although additional monitoring is needed to make a determination regarding whether the colony is stable, increasing, or decreasing at this site.

Monitoring data, including extensive exit counts to estimate maternity colony population size and structure over more than one-year, is available for only a few of the approximately 246 maternity colonies discovered (Humphrey et al. 1977; Garner and Gardner 1992; Callahan 1993; Gardner et al. 1991b; Kurta et al. 1993; Indianapolis Airport Authority 2003; Indianapolis Airport Authority 2004). Additionally, because the vast majority of the Indiana bat maternity colonies have not been discovered, let alone studied, what little demographic data that is available, represent a fraction of the range-wide maternity activity.

Because so little is known regarding the population size and structure of maternity colonies, the Service used the same assumption as Whitaker and Brack (2002) to determine the average maternity colony size to give an approximation of the number of potential maternity colonies across the range of the Indiana bat. The Service recognizes that maternity colonies are not static in size, and the numbers of individuals that comprise a maternity colony likely vary widely as a colony adjusts to current conditions, including the availability and quality of roosting and foraging habitat, and variable climatic conditions. Therefore, these figures should not be used to make extrapolations regarding the densities or distribution of maternity colonies present within portions of the species range (Racey and Entwistle 2003); however, these figures do serve to provide a rough estimation regarding the number of maternity colonies that might be present across the landscape. The "Maternity Colony Size – Population" section found in the "Life History" section of this biological opinion provides more information with regard to the size of a maternity colony.

Recognizing the inherent deficiency in such an assumption, these calculations illustrate that the vast majority of maternity colonies for the Indiana bat have not been documented (Table 5). The location of most maternity colonies may always remain unknown because of the difficulty in detecting maternity activity for the Indiana bat. Some unknown proportion of these colonies may be at risk when land use practices and changes, such as timber harvesting and development, are carried out. Therefore, another likely cause for the decline of this species and the level of activity occurring across the landscape is that maternity colonies are being reduced in numbers, and in some cases extirpated, prior to their discovery.

Indiana Bat Status in Indiana

Historic hibernating population levels in Indiana were comprehensive enough to estimate on a statewide level for the first time in 1981, resulting in an estimate of 147,242 hibernating bats (Andrew King, USFWS, personal communication). Since that time, the statewide estimate fell to a low of 97,503 bats in 1985, then rose steadily to 175,795 in 1993. After that year, the population estimate fluctuated between 173,076 and 185,899 until the 2005 census, when it rose to 206,610. As of the winter of 2004-2005, Indiana's 40 hibernacula harbored approximately 45.2% of all known Indiana bats. In 2005, the two most populous Indiana bat hibernacula in the world were Cave (n=54,913 bats) and Cave (n=54,325 bats).

<u>Previous Incidental Take Authorizations</u>

Summary- All previously issued Service Biological Opinions involving the Indiana bat have been non-jeopardy. These formal consultations have involved (a) the Forest Service for activities implemented under various Land and Resource Management Plans on National Forests in the eastern United States, (b) the Federal Highway Administration for various transportation projects, (c) the U.S. Army Corps of Engineers (Corps) for various water-related projects, and (d) the Department of Defense for operations at several different military installations. Additionally, an incidental take permit has been issued under section 10 of the Endangered Species Act to an Interagency Taskforce for expansion and related development at the Indianapolis Airport in conjunction with the implementation of a Habitat Conservation Plan.

It is important to note that in many of these consultations, survey information was lacking. As Federal agencies are not required to conduct surveys, often the Service relied on a host of valid factors in helping the Federal agency determine whether Indiana bats may be present. To ensure the Federal agency and the Service met the mandate of the section 7(a)(2), if the best available data indicated that Indiana bats may be present, the assumption was made that a maternity colony (in most instances) occurred within the action area. Although this approach, we believe, fully accords with the intent of Congress and the Endangered Species Act of 1973, it likely resulted in an over-estimate of the number of individuals or colonies that may have been impacted by Federal actions.

National Forests- Within the past several years, nearly all National Forests within the range of the Indiana bat have requested formal consultation at the programmatic level including the HNF. Consultation under Section 7 of the Act is necessary to ensure agency actions do not jeopardize the continued existence of listed species. These consultations have led to non-jeopardy biological opinions with associated incidental take statements. Although some of these incidental take statements anticipated the take of reproductive females, we have not yet confirmed a loss of a maternity colony on a National Forest. The reasons for this are likely two-fold. First, the programmatic conservation measures (i.e., standard and guidelines) and second, the project-specific reasonable and prudent measures were designed to minimize maternity colony exposure to the environmental impacts of Forest Plan actions. Specifically, these measures ensured an abundance of suitable Indiana bat habitat on the National Forests, and protected all known or newly discovered maternity colonies.

Approximately 95 percent of previously authorized habitat loss on National Forests has not been a permanent loss. Rather, it has been varying degrees of temporary loss (short-term and long-term) as a result of timber management activities. Although this analysis does not include all National Forests that, to date, have received an incidental take statement, the concepts of the analysis are consistent, regardless of the location. Conservation measures provided by the USFS as part of the proposed action, as well as reasonable and prudent measures provided by the Service to minimize the impact of the annual allowable take for each of the National Forests, have been designed to: (1) ensure an abundance of available remaining Indiana bat roosting and foraging habitat on all

National Forests; and (2) ensure persistence of any known or newly discovered maternity colonies to the maximum extent practicable.

Although Indiana bat presence has been verified on most, if not all, National Forests within the range of the species, confirmation of maternity activity on these lands is relatively scant. There have been less than seven maternity colonies documented on National Forests. It must be noted that maternity activity was confirmed for the first time on two national forests (Monongahela National Forest [West Virginia] and Hoosier National Forest [Indiana]) as recently as 2004.

Take has been authorized in the form of habitat loss because of the difficulty of detecting and quantifying take of the Indiana bat due to the bat's small body size, widely dispersed individuals under loose bark or in cavities of trees, and unknown spatial extent and density of their summer roosting population range within the respective National Forests. For some incidental take statements, take has also been extrapolated to include an estimated number of individual Indiana bats. The estimate of the number of individual Indiana bats likely to be taken has been wide-ranging and based on various assumptions. Legal coverage has included the take, by kill, of individual Indiana bats; or take, by harm through habitat loss, or harassment.

Other Federal Agencies or Non-federal Entities- Several incidental take statements have been issued to other Federal agencies. Unlike those issued for the National Forest Land and Resource Management Plans, some of these projects were certain to impact known occupied habitat. To minimize the effect of these projects, the action agencies agreed to implement various conservation measures. These included: seasonal clearing restrictions to avoid disturbing female Indiana bats and young; protection of all known primary and alternate roost trees with appropriate buffers; retention of adequate roosting and foraging habitat to sustain the maternity colony into the future; and permanent protection of areas and habitat enhancement or creation measures to provide future roosting and foraging habitat opportunities.

With the exception of three (Fort Knox, Great Smoky Mountains National Park, and Laxare East and Black Contour Coal Mining projects), none of these biological opinions and associated incidental take statements anticipated the loss of a maternity colony. Required monitoring for three formal consultations in Indiana (Camp Atterbury, Newport Military Installation, and Indianapolis Airport) has confirmed that the affected colonies persisted through the life of the project and continue to exist today. We recognize that given the philopatric nature of Indiana bats and their long life-spans, the full extent of the anticipated impacts may not yet have occurred. Nonetheless, these monitoring results and the lack of data to suggest otherwise for the other projects, indicate that the conservation measures to avoid and minimize the impacts of Federal projects appear to be effective. Only with long-term monitoring will we definitively be able to determine the true effectiveness of our conservation measures.

In summary, we believe the take exempted to date via section 7 consultation has resulted in short-term effects to Indiana bat habitat and, in limited circumstances, on Indiana bat maternity colonies. As many of these consultations necessarily made assumptions about Indiana bat presence, we are uncertain of the actual number of maternity colonies exposed to environmental impacts of Federal actions throughout the species' range, but we believe the actual number is likely less than what we have assumed to be present. Furthermore, although not definitive, monitoring of several maternity colonies pre- and post-project implementation preliminarily suggests that our standard conservation measures, when employed in concert, appear to be effective in minimizing adverse effects on the affected maternity colonies.

Indiana Bat Description and Distribution

The Indiana bat is a medium-sized bat with a head and body length that ranges from 41 to 49 mm (Thompson 1982). There are no recognized subspecies. The species range includes much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. The Indiana bat is migratory, and the above described range includes both winter and summer habitat. The winter range is associated with regions of well-developed limestone caverns. Major populations of this species hibernate in Indiana, Kentucky, and Missouri. Smaller winter populations have been reported from Alabama, Arkansas, Georgia, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. Two-thirds (66%) of the entire estimated 2005 population of Indiana bats hibernated in only eight hibernacula in Illinois, Indiana, Kentucky, Missouri, and New York and more the 75% of the rangewide population hibernated in only 12 hibernacula (USFWS unpublished data, 2006).

Table 5. Estimated number of Indiana bat maternity colonies range-wide.

Year	Estimated Rangewide Population	% Change from Previous Period	Estimated Number of Maternity Colonies[1]	Approximate Number of Known Maternity Areas[2]	% of Est. Maternity Colonies that are Known
1960/1970	883,300		5,500	1 (in 1971)	~0.02%
~1980	678,750	-23%	4,200	31	~0.7%-
~1990	473,550	-30%	3,000	70	~2.3%
2001	376,932	-20%	2,400	149	~6.2%
2005/2006	457,374	+22%	2,900	246	~8.5%

[1] Total rounded to the nearest 100. Estimates of the number of maternity colonies rangewide were developed based on the following assumptions: 1) the known hibernating population is the source of the entire summer population; 2) there is a 50:50 sex ratio (Humphrey et al. 1977); 3) average maternity colony size of 80 adult females (Whitaker and Brack 2002); and 4) the trend in decline of the total number of maternity colonies follows that of the hibernating population. [2] This is the number of areas where reproductive females and/or juveniles have been captured during the maternity season (USFWS, unpublished data, 2006).

Life History

The average life span of the Indiana bat is 5 to 10 years, but banded individuals have lived up to 14 and 15 years (Thomson 1982). Female survivorship in an Indiana population was 76% for ages 1 to 6 years and 66% for ages 6 to 10 years. Male survivorship was 70% for ages 1 to 6 years and 36% for ages 6 to 10 years (Humphrey and Cope 1977).

Summering Indiana bats (males and females) roost in trees in riparian, bottomland, and upland forests. Roost trees generally have exfoliating bark which allows the bat to roost between the bark and bole of the tree. Cavities and crevices in trees also may be used for roosting. A variety of tree species are used for roosts including (but not limited to) silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus* *americana*), eastern cottonwood (*Populus deltoides*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*) , white oak (*Quercus alba*), shingle oak (*Quercus imbricaria*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), and sassafras (*Sassafras albidum*)(Rommé et al. 1995). At one site in southern Indiana, black locust (*Robinia psuedoacacia*) was used extensively by roosting bats (Pruitt 1995). Structure is probably more important than the species in determining if a tree is a suitable roost site; and tree species which develop loose, exfoliating bark as they age and die are likely to provide roost sites. Male bats disperse throughout the range and roost individually or in small groups. In contrast, reproductive females form larger groups, referred to as maternity colonies in which they raise their offspring.

Females arrive in summer habitat as early as April 15. Temporary roosts are often used during spring until a maternity roost with large numbers of adult females is established. Indiana bats arrived at maternity roosts in April and early May in Indiana, with substantial numbers in mid-May. Most documented maternity colonies have 50 to 100 adult bats (USFWS 1999). Fecundity is low; and female Indiana bats produce only one young per year in late June to early July. Young bats can fly between mid-July and early August, at about 4 weeks of age. Mortality between birth and weaning was found to be about 8% (Humphrey et al. 1977). Many males stay near hibernacula (i.e., caves and mines) and roost individually or in small groups (Whitaker and Brack 2002). The later part of the summer is spent accumulating fat reserves for fall migration (USFWS 1999).

When arriving at their traditional hibernacula in August-September, Indiana bats “swarm”. Some male bats may begin to arrive at hibernacula as early as July. Females typically arrive later and by September numbers of males and females are almost equal. Swarming is a critical part of the life cycle when Indiana bats converge at hibernacula, mate, and forage until sufficient fat reserves have been deposited to sustain them through the winter (Cope et al. 1977, USFWS 1983). Swarming behavior typically involves large numbers of bats flying in and out of cave entrances throughout the night, while most of the bats continue to roost in trees during the day. Body weight may increase by 2 grams within a short time, mostly in the form of fat. Swarming continues for several weeks and copulation occurs on cave ceilings near the cave entrance during the latter part of the period. (USFWS 1991 b, USFWS 1999). The time of highest swarming activity in Indiana and Kentucky has been documented as early September (Cope et al. 1977). By late September many females have entered hibernation, but males may continue swarming well into October in what is believed to be an attempt to breed with late arriving females. Research is needed to determine how far bats will forage in the fall. Most bats tracked have stayed within 2 to 3 miles of the hibernacula, but some have been found up to 4.2 miles away (Rommé et al. 2002). Studies suggest that the majority of foraging habitat in spring and autumn is within 2 mi of the hibernacula, but extends to 5 miles. Therefore, it is not only important to protect the caves that the bats hibernate in, but also to maintain and protect the quality and quantity of roosting and foraging habitat within 5 miles of each Indiana bat hibernaculum. Additional studies of fall swarming behavior are warranted to gain a better understanding of the bats’ behavior and habitat needs during this part of its annual life cycle (Rommé et al. 2002).

During swarming, males are active over a longer period of time at cave entrances than females, probably to mate with females as they arrive. Females may mate their first autumn, whereas males may not mature until the second year (USFWS 1999). After mating, females soon enter into hibernation. Most bats are hibernating by the end of November, but hibernacula populations may continue to increase (USFWS 1999). Indiana bats cluster and hibernate on cave ceilings in densities of approximately 300-484 bats per square foot, from approximately October through April. Hibernation facilitates survival during winter when prey (i.e., insects) is unavailable. The season of hibernation may vary by latitude and annual weather conditions. Clusters may protect central individuals from temperature change and reduce sensitivity to disturbance. Like other cave bats, the Indiana bat naturally arouses at intervals of 7-14 days (Dr. John Whitaker, Jr. – per. comm.) during hibernation (Sealander & Heidt 1990). Arousals are more frequent and longer at the beginning and end of the hibernation period (Sealander & Heidt 1990). Limited mating occurs throughout the winter, and in early April as bats emerge (USFWS 1999).

After hibernation ends in late March or early April, most Indiana bats emerge, and forage for a few days or weeks near their hibernaculum before migrating to their traditional summer roosting areas. Female Indiana bats emerge first from hibernation in late March or early April, followed by the males. The timing of annual emergence may vary across their range depending on latitude and annual weather conditions. Shortly after emerging from hibernation, the females become pregnant via delayed fertilization from the sperm that has been stored in their reproductive tracts through the winter (USFWS 1999). The period after hibernation but prior to spring migration is typically referred to as "staging". Most populations leave their hibernacula by late April. Migration is stressful for the Indiana bat, particularly in the spring when their fat reserves and food supplies are low. As a result, adult mortality may be the highest in late March and April.

Most bats migrate to the north for the summer, although other directions have been documented (USFWS 1999, Gardner and Cook 2002). A stronger homing tendency has been observed along a north-south axis, than the east-west direction in release studies. Females can migrate hundreds of miles north of the hibernacula. In spring staging, males have been found almost 10 miles from their hibernacula (Hobson and Holland 1995). Less is known about the male migration pattern, but many males summer near the hibernacula (Whitaker and Brack 2002, USFWS 1999).

Food Habits:
Indiana bats feed exclusively on flying aquatic and terrestrial insects. Diet varies seasonally and variations exist among different ages, sexes, and reproductive status (USFWS 1999). It is probable that Indiana bats use a combination of both selective and opportunistic feeding to their advantage (Brack and LaVal 1985). Reproductively active females and juveniles show greater dietary diversity perhaps due to higher energy demands. Studies in some areas have found that reproductively active females eat more aquatic insects than do juveniles or adult males (USFWS 1999), but this may be the result of habitat differences (Brack and LaVal 1985).

Lepidoptera (moths), Coleoptera (beetles), and Diptera (midges and flies) consititute the bulk of the diet (Brack and LaVal 1985). Moths (Lepidoptera) have been identified as major prey items that may be preferentially selected (Brack and LaVal 1985), but beetles (Coleoptera) and flies (Diptera) were also found significant (Brack and Tyrell 1990). Diptera taken are especially midges and other species that congregate over water, but are seldom mosquitoes. Other prey include wasps and flying ants (Hymenoptera), caddisflies (Trichoptera), brown leafhoppers and treehoppers

(Homoptera), stoneflies (Plecoptera), and lacewings (Neuroptera) (Brack and LaVal 1985, USFWS 1999). Male Indiana bats summering in or near a hibernation cave eat primarily moths and beetles but feed on other terrestrial insects in lower percentages (USFWS 1999).

Indiana bats use small impoundments as well as permanent and intermittent streams for drinking water (HNF 2000). Water-filled road ruts may be used for drinking water in uplands, more commonly in the eastern portion of the range (Brack, Jr. per. comm.).

Habitat: Winter Hibernacula Habitat

Indiana bats roost in caves or mines with configurations that provide a suitable temperature and humidity microclimate (Brack et al. 2003, USFWS 1999). In many caves, suitable temperatures and therefore roosts are located near the cave entrance, but roosts may be deeper where cold air flows and is trapped. When bats arrive at hibernacula in October and November, they need a temperature of 50º F (10º C) or below (USFWS 1999). Mid-winter temperatures range from 39 to 46º F (4 to 8º C) (USFWS 1983); however, recent data in Indiana has recorded increased use of hibernacula ranging from 41 to 44.5º F (5 to 7º C) (Brack, Jr. per. comm.). Only a small percentage of caves available meet these temperature requirements (Brack et al. 2003, USFWS 1999). Stable low temperature allows bats to maintain low metabolic rates and conserve fat reserves to survive the winter (USFWS 1999). Relative humidity of roosts usually ranges from 74% to just below saturation, although readings as low as 54% have been recorded. This may be an important factor for successful hibernation (USFWS 1999). Hibernacula often contain large populations of several species of bats. Other bat species found in Indiana hibernacula include: a number of little brown bats (*Myotis lucifugus*) and eastern pipistrelles (*Pipistrellus subflavus*); some northern long-eared bats (*Myotis septentrionalis*); and a few gray bats (*Myotis grisescens*), big brown bats (*Eptesicus fuscus*), and silver-haired bats (*Lasionycteris noctivagans*) (Brack et al.2003).

Habitat: Summer Roosting Habitat

FEMALE

Indiana bats exhibit strong site fidelity to their traditional summer colony areas and foraging habitat, that is, they return to the same summer range annually to bear their young. (Kurta et al. 2002, Garner and Gardner 1992, USFWS 1999). Traditional summer sites that maintain a variety of suitable roosts are essential to the reproductive success of local populations. It is not known how long or how far female Indiana bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that this effort places additional stress on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy.

Female Indiana bats generally migrate northward from the hibernacula to summer roosting areas. Indiana bat maternity colonies typically occupy multiple roosts in riparian, bottomland, and upland forests. Roost trees generally have exfoliating bark which allows the bat to roost between the bark and bole of the tree and have a southeast or south-southwest solar exposure and an open canopy. Cavities and crevices in trees also may be used for roosting. Roost tree structure is probably more important than the tree species in determining whether a tree is a suitable roost site; and tree species which develop loose, exfoliating bark as they age and die are likely to provide roost sites. Roost trees are often located on forest edges or openings with open canopy and open understory (USFWS 1999). Maternity colonies have often been found within forests that are streamside ecosystems or are otherwise within 0.6 mi (1 km) of permanent streams. Most have been found in forest types similar to oak-hickory and elm-ash-cottonwood communities. While these characteristics are typical, research is showing adaptability in habitats used. Important summer roosting and foraging habitat for the Indiana bat is often in floodplain or riparian forests but may also be in more upland areas. A telemetry study in Illinois found most maternity roosts within 1640 ft (500 m) of a perennial or intermittent stream (Hofmann 1996). Bats in Illinois selected roosts near intermittent streams and far from paved roads (Garner and Gardener 1992). However, observations have revealed habitat use nearer paved roads than previously thought (Brack, Jr. per. comm.). Recent research has shown bats using upland forest for roosting and upland forest, and pastures with scattered trees for foraging. Indiana bats prefer forests with old growth characteristics, large trees, scattered canopy gaps, and open understories (USFWS 1999). The Indiana bat may persist in highly altered and fragmented forest landscapes for some unknown period of time. Instances have been documented of bats using forest altered by grazing, swine feedlot, row-crops, hay fields, residences, clear-cut harvests, and shelterwood cuts (Garner and Gardner 1992, USFWS 1999). Several roosts have been located near lightly traveled, low maintenance roads, as well as near I-70 at the Indianapolis Airport (USFWS 2002). Although, Indiana bats may be more adaptable than previously thought, it still is not known how a maternity colony's stability and reproductive success responds to increasing levels of habitat alteration and fragmentation.

Suitability of a roost tree is determined by its condition (dead or alive), suitability of loose bark, tree's solar exposure, spatial relationship to other trees, and tree's spatial relationship to water sources and foraging areas. Good roost trees are species whose bark springs away from the tree on drying after dead, senescent, or injured; and living species of hickories (*Carya* spp.) and large white oaks (*Quercus alba*) with shaggy bark. Cottonwoods are probably one of the best tree species. Many maternity colonies have been associated with oak-hickory and elm-ash-cottonwood forest types. Tree cavities, hollow portions of tree boles or limbs, and crevice and splits from broken tops have been used as roosts on a very limited basis, usually by individual bats. Roost longevity is variable due to many factors such as the bark sloughing off or the tree falling down. Some roosts may only be habitable for 1-2 years, but species with good bark retention such as slippery elm (*Ulmus rubra*), cottonwood (*Populus deltoides*), Green ash (*Fraxinus pennsylvanica*), oaks (*Quercus* spp.), and hickories (*Carya* spp.) may provide habitat 4-8 years (USFWS 1999). Trees in excess of 15.7 in (40 cm) diameter breast height (dbh) are considered optimal for maternity colonies, but trees in excess of 8.6 in (22 cm) dbh are used as alternate roosts (USFWS 2002). Females have been documented using roost trees as small as 5.5 inches.(Kurta 2005).

Indiana bat roosts are ephemeral and frequently associated with dead or dying trees. Gardner et al. (1991b) evaluated 39 roost trees and found that 31% were no longer suitable the following summer, and 33% of those remaining were unavailable by the second summer. A variety of suitable roosts are needed within a colony's traditional summer range for the colony to continue to exist. Indiana bat maternity sites generally consist of one or more primary maternity roost trees which are used repeatedly by large numbers of bats, and varying numbers of alternate roosts, which may be used less frequently and by smaller numbers of bats. Primary roosts are often located in openings or at the edge of forest stands, while alternate roosts can be in either openings or the interior of the forest stand. Primary roosts are usually surrounded by open canopy and are warmed by solar radiation. Alternate roosts may be used when temperatures are above normal or during precipitation. Bats move among roosts within a season and when a particular roost becomes unavailable from one year to the next. It is not known how many alternate roosts must be available to assure retention of a colony within a particular area, but large, nearby forest tracts would improve the potential for an area to provide adequate roosting habitat (Callahan 1993, Callahan et al. 1997). In addition to having exfoliating bark, roost trees must be of sufficient diameter. Trees in excess of 16 in. diameter at breast height (dbh) are considered optimal for maternity colony roost sites, but trees in excess of 9 inches dbh are often used as alternate maternity roosts. Male Indiana bats have been observed roosting in trees as small as 2.5 inches dbh (Gumbert et al. 2002).

Exposure of trees to sunlight and location relative to other trees are important to suitability. Cool temperatures can delay development of fetal and juvenile young and selection of maternity roost sites may be critical to reproductive success. Dead trees with a southeast and south-southwest exposures allow warming solar radiation. Some living trees may provide a thermal advantage during cold periods (USFWS 1999). Maternity colonies use multiple roosts in both dead and living trees that are grouped. Extent and configuration of a use area is probably determined by availability of suitable roost sites. Distances between roosts can be a few meters to a few kilometers. Maternity colony movements among multiple roosts seem to depend on climatic changes, particularly solar radiation (Humphrey et al. 1977). Kurta et al. (1993) suggests movement between roosts may be the bats' way of dealing with a roost site as ephemeral as loose bark. The bat that is aware of alternate roost sites is more likely to survive the sudden, unpredictable, destruction of its present roost than the bat which has never identified such an alternate.

Primary roosts are often located in openings or at the edge of forest stands, while alternate roosts can be in either openings or the interior of the forest stand. Primary roosts are usually surrounded by open canopy and are warmed by solar radiation. Alternate roosts may be used when temperatures are above normal or during precipitation. Shagbark hickories (*Carya ovata*) are good alternate roosts because they are cooler during periods of high heat and tight bark shields the bats from rain (USFWS 1999). Weather has been found to have profound influence on bat behavior and habitat use (Humphrey et al. 1977).

Humphrey et al. (1977) observed that each night after the sunset peak of foraging activity the bats left the foraging areas without returning to the day roosts, which indicated the use of "night" roosts. Kiser et al. (2002) found three concrete bridges on Camp Atterbury, 25 mi (40 km) south of Indianapolis, Indiana, used by Indiana bats as night roosts and to a limited extent as day roosts. Bat species using the bridges included the big brown bat (*Eptesicus fuscus*), northern myotis (*Myotis septentrionalis*), little brown myotis (*Myotis lucifugus*), Indiana bat, and eastern pipistrelle (*Pipistrellus subflavus*). The Indiana bat was the most common species, representing 51% of all bats observed, whereas the big brown bat was the second most abundant at 38%. Clusters of Indiana bats were observed night roosting under the bridges that were lactating, post-lactating, and newly volant juveniles. Bridges used were concrete-girder (multi-beam) bridges with deep, narrow expansion joints. The bridges ranged from 46 to 223 ft in length and 26 to 39 ft in width. Average daily traffic ranged from less than 10 vehicles per day to almost 5,000 vehicles per day. All used bridges were located over streams bordered by forested, riparian corridors that connected larger tracts of forest. Riparian forest did not overhang the bridges allowing solar radiation to warm the bridges; however, forest was within 9 to 16.5 ft of each bridge. Bat clusters under bridges were located over land, near the ends of the bridges. Mean ambient temperatures at night were consistently higher and less variable under bridges than external ambient temperatures. The bridges apparently act as thermal sinks. The warmer, more stable environment presumably decreases the energetic cost of maintaining high body temperature, thus promoting fetal development, milk production, and juvenile growth. Three individuals were radio-tracked to their day roosts within 0.6 to 1.2 miles from their night roost (Kiser et al. 2002).

MALE:
Many male Indiana bats appear to remain at or near the hibernacula in summer with some fanning out in a broad band around the hibernacula (Whitaker and Brack 2002). Males roost singly or in small groups in two to five roost trees similar to those used by females. Males may occasionally roost in caves. Suitable roost trees typically have a large diameter, exfoliating bark, and prolonged solar exposure with no apparent importance in regard to the tree species or whether it is upland or bottomland (Whitaker and Brack 2002). Because males typically roost individually or in small groups, the average size of their roost trees tends to be smaller than the roost trees used by female maternity colonies, and in one instance a roost tree only 2.5 inches (6.4 cm) in diameter was used (Gumbert et al. 2002). Male bats have also been observed using trees as small as 3.1 in (8 cm) dbh (USFWS 2002). Also, males are more likely than females to be found in disturbed areas; possibly because the roost trees in those areas are likely to be to small for colony use, but still suitable for an individual roost (Brack, Jr. per. comm.). One individual was found roosting on the Hoosier National Forest within the easement of I-64 (HNF 2000). Males have shown summer site fidelity and have been recaptured in foraging areas from prior years (USFWS 1999). At Camp Atterbury in Indiana, male bats were observed using the same bridges as females for night roosts, but they roosted singly (Kiser et al. 2002).

Autumn Swarming / Spring Staging Habitat
Indiana bats use roosts in spring and fall that are similar to those used in summer (USFWS 1999). However, because habitat is used by individuals rather than colonies, sites may be much smaller (Brack, Jr. per. comm.). Females use smaller, more disturbed areas during swarming and staging than in summer in maternity colonies (Brack, Jr. per. comm.). During fall, when bats swarm and mate at their hibernacula, male bats roost in trees nearby during the day and fly to the cave during the night. Studies have found males roosting in dead trees on upper slopes and ridgetops within a few miles of the hibernacula (USFWS 1999). In Jackson County, Kentucky, research showed fall roost trees tend to be located in canopy gaps created by disturbance (logging, windthrow, prescribed burning) and along edges (Gumbert et al. 2002). Fall roost trees are often exposed to sunshine (USFWS 1999). Within-year fidelity to fall roosts has been observed, where an individual bat uses an individual roost for an average of 2 to 3 days before moving to a new tree (Gumbert et al. 2002). Bats have been observed moving among multiple roosts in an area using particular roosts alternatively (Brack, Jr. per. comm., Gumbert et al. 2002).

In the spring, upon emergence, females and some males disperse from the hibernacula. Migration within the core of the species' range is generally northward to form colonies throughout Indiana, southern Michigan, and adjoining Ohio and Illinois. Male Indiana bats remain at or near the hibernacula, although some fan out in a broad band or zone around the hibernacula (Whitaker and Brack 2002).

Spring and autumn habitat use is variable due to proximity and quantity of roosts, weather conditions, and prey availability (Rommé et al. 2002). Several studies support the idea that during the autumn and spring, bats primarily use habitat within 5 miles (8 km) of the hibernacula (Rommé et al. 2002, Brack, Jr. per. comm.). However, more studies of autumn and spring habitat use is recommended due to low sample sizes and difficulties with telemetry research techniques (USFWS 1999).

Foraging Habitat
Indiana bats forage between dusk and dawn and feed exclusively on flying insects, primarily moths, beetles, and aquatic insects. They typically forage in and around tree canopy and in openings of floodplain, riparian, and upland forests (USFWS 1999). Optimum canopy closures are 50-70% with relatively open understory (<40% of trees are 2-4.7 in (5-12 cm) dbh) (HNF 2000). Woody vegetation with a width of at least 100 ft (30 m) on both sides of a stream has been characterized as excellent foraging habitat. Streams, associated with floodplain forests and impounded water bodies, are preferred foraging habitats for pregnant and lactating Indiana bats, some of which may fly up to 1 ½ mi from upland roosts (Garner and Gardner 1992, USFWS 2002). Brack and Tyrell (1990) found that in early summer, foraging was restricted to riparian habitats. Foraging also occurs over clearings with successional vegetation, along cropland borders, fencerows, and over farm ponds. Bats have been observed crossing Interstate 70 in Indiana to reach foraging habitat (USFWS 2002). Bats have been documented routinely flying at least 1.25 mi (2 km) from the roost to forage and some were tracked up to 3 mi (5 km) from the roost (USFWS 2002). Foraging bats usually fly between 6 – 100 feet above ground level (USFWS 1999). In Illinois, Gardner et al. (1991a) found that forested stream corridors, and impounded bodies of water, were preferred foraging habitats for pregnant and lactating Indiana bats, which typically flew up to 1.5 miles (2.4 km) from upland roosts to forage. However the same study reported the maximum distance that any female bat flew (regardless of reproductive status) from her daytime roost to her capture site was 2.5 miles (4.2 km). Females typically utilize larger foraging ranges than males (Garner and Gardner 1992).

<u>Bald Eagle</u>

This section is a discussion of the range-wide status of the bald eagle (*Haliaeetus leucocephalus*) and presents biological and ecological information relevant to formulating the biological opinion. It includes information on the species' life history, its habitat and distribution, and the effects of past human and natural factors that have led to the current status of the species.

Designated as the national bird of the United States in 1782, the bald eagle nested throughout the nation. In 1940, the bald eagle was originally protected by what is now known as the Bald and Golden Eagle Protection Act (BGEPA). This law provides for the protection of the bald eagle and the golden eagle (as amended in 1962) by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 668(a); 50 CFR 22). "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb (16 U.S.C. 668c; 50 CFR 22.3). On March 11, 1967, bald eagles south of the 40th parallel were listed under the Endangered Species Preservation Act of 1966. The bald eagle was also afforded protection under the Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703-712) when it was amended to include native birds of prey in 1972. The bald eagle was subsequently listed as threatened under the Endangered Species Act of 1973 (ESA; 41 FR 24062 24067) on February 14, 1978 in Michigan, Minnesota, Oregon, Washington, and Wisconsin, and as endangered in the 43 remaining conterminous states. Due to the wide distribution of the bald eagle, the Service established five recovery regions to outline recovery planning goals and needs on a regional basis, leading to the development of five separate recovery plans for the species. Bald eagles in the State of Indiana are addressed in the Northern States Bald Eagle Recovery Plan, which was approved by the Service on July 29, 1983. No Critical Habitat was designated under the ESA for the bald eagle. In July 1995, as a result in wide-spread population increases, the Service down-listed the species to threatened status under the ESA throughout the lower 48 states. Then on July 6, 1999, after reaching or exceeding the recovery goals for the species, the Service proposed to remove the bald eagle from the Federal Threatened and Endangered Species List (i.e., delist it; Figure 7). Currently, the Service considers the bald eagle population to be fully recovered, even though it remains listed as a Federally threatened species in the lower 48 states. The bald eagle delisting has been delayed while a new post-delisting bald eagle disturbance permit process is being established under the Bald and Golden Eagle Protection Act. Once delisted, the ESA would require the Service to monitor the status of the bald eagle for at least five years following delisting. If a delisted species is found to be at risk, the Service can review the best available information and if necessary invoke the emergency listing clause of the ESA and relist the species.

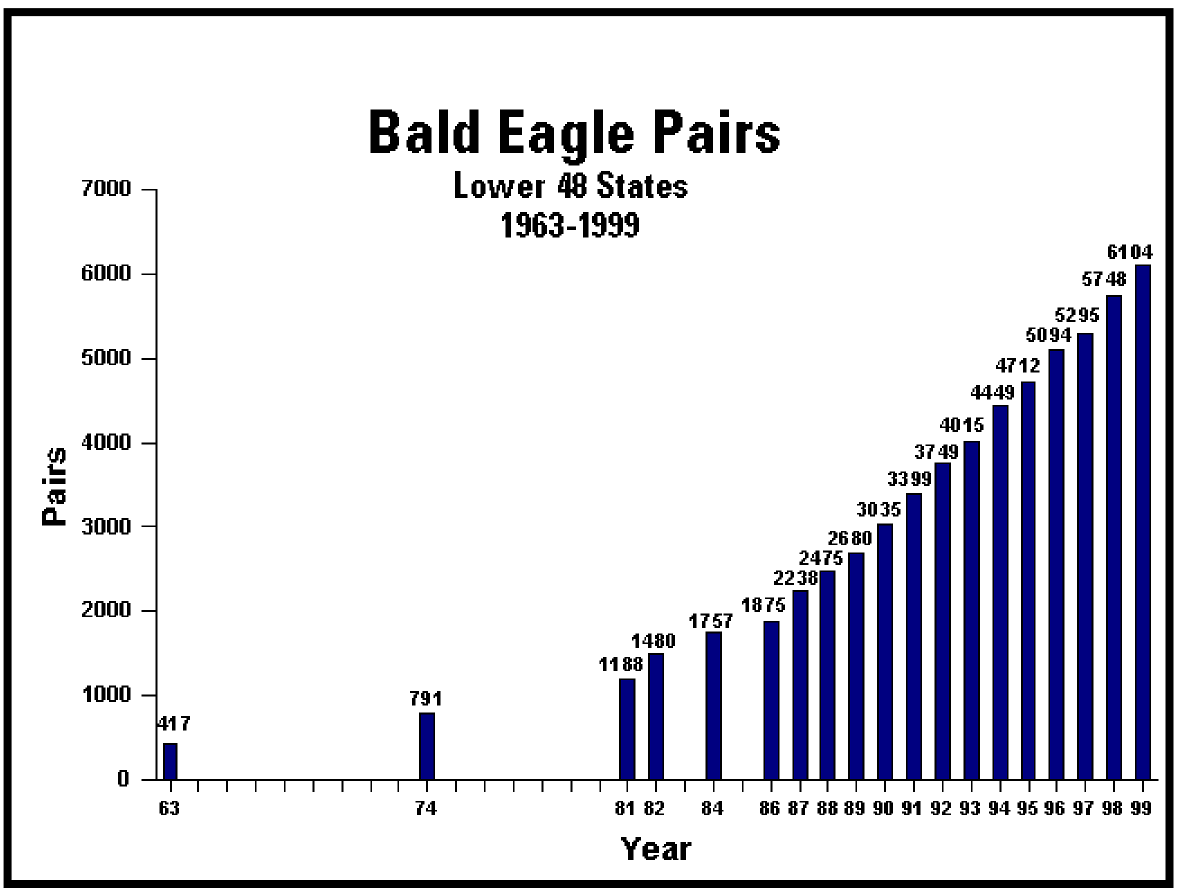

Figure 7. Pairs of nesting bald eagles in the lower 48 states, 1963 – 1999 (USFWS 2003).

A variety of factors contributed to bald eagle population declines over the past century (USFWS 1983a), but habitat loss and pesticide use, such as DDT, were the primary causes of decline. Habitat loss first occurred during European settlement of North America. As settlers cleared the land, they removed suitable trees for bald eagle nest and roost sites, as well as habitat for their prey. Wide spread shooting of eagles was also a contributing factor to the species' decline. Bald eagle numbers began to increase in the U.S. after Federal laws were enacted to protect them, however they began to decline again in the 1940s due to the wide spread use of certain organophosphate pesticides. These pesticides, DDT being the most notable, were used during the 1940s, 1950s, and 1960s. Pesticides like DDT and their metabolites tend to bioaccumulate, or increase in concentration as they move up the food chain, and therefore are present in highest concentrations in animals at the top of their food chain, such as bald eagles. A metabolite of DDT, known as DDE, inhibits normal calcium deposition in birds when eggshells are being formed. This resulted in eggshell thinning and reproductive failure in the bald eagle and other birds. Successful reproduction virtually ceased. In 1972, the U.S. Environmental Protection

Agency (USEPA) banned the use of DDT because of its harmful environmental effects. Bald eagle populations began to increase after the ban of DDT (see Figure 4). After banning DDT and implementing recovery actions under the ESA for over 30 years including: protecting/enhancing habitat, minimizing disturbance, monitoring contaminants, and reintroducing eagles, there are now more than 6,471 pairs of bald eagles nesting in the lower 48 states and the species has recovered.

Even though bald eagle numbers have increased dramatically, continued habitat loss, accidental trauma, illegal shooting, electrocution, and poisoning remain a threat to eagles and need to be monitored. Loss of forest habitat along and near large water bodies limits the available amount of suitable nesting, perching, roosting, and foraging habitat. Degradation of water quality also continues to threaten the integrity of aquatic ecosystems and the fish the eagles need for food.

Toxic exposure to environmental contaminants also is a localized threat. Franson et al. (1995) investigated the cause of death for over 4,300 bald and golden eagle carcasses examined over a 30 year period. Because identifying cause of death depends on finding eagle carcasses in fair to good condition, and advances in diagnostic capabilities, the study results may not reflect proportional causes of death accurately. Nonetheless, Franson et al. identified accidental trauma associated with impacts with vehicles, power lines, or other structures as the leading cause of death (23% of cases). Vehicular collisions have occurred as bald eagles scavenge carrion/roadkill along roadways, particularly in winter when food is scarce. The risk of vehicular collisions is directly influenced by landcover near the road. Roadways within a dense forest corridor present more risk than those with open roadsides because eagle are limited to vertical avoidance movements. Gunshot, either accidental or on purpose, accounted for about 15% of bald eagle deaths, electrocution about 12%, and poisoning about 16% (Franson et al. 1995). Electrocution problems with bald eagles, and other raptors, are primarily associated with relatively low voltage distribution lines (below 69 kV) to residences, businesses, or other individual users (Lehman 2001). Measures such as increasing clearances between conductors and ground wires, gapping ground wires, insulating energized components, and managing perching opportunities can reduce electrocution hazards and have been implemented in some problematic areas (Lehman 2001). Many eagles have died from lead poisoning after ingesting lead bullet fragments imbedded in crippled prey or carrion. Mortality may also occur from poisoning of certain agricultural pesticides. Poly-chlorinated biphenyls (PCBs) may also be a localized source of contamination, and have been linked to reproductive failure in bald eagles. PCBs, like DDT and other pesticides, often bioaccumulate and end up in higher concentrations in animals at the top of the food chain.

Description and Distribution

The bald eagle is a large bird of prey found only in North America. The adult bald eagle is named for its white or bald (the old English word "balde" meaning white) head. The rest of the adult's plumage is dark brown with the exception of the tail feathers which are white. Males and females are identical in color. Immature bald eagles are dark brown with some blotches of white under the wings and on the body. As the bird reaches maturity in four or five years, this mottling disappears. Young bald eagles can be confused with the similar colored golden eagle (*Aquila chrysaetos*). Juvenile bald eagles have a brownish bill and yellow feet, while adults have bright yellow eyes, bills, and feet. The body of an adult eagle is about 3 to 3 1/2 feet in length, and the wingspan is 6 to 7 1/2 feet. Males weigh eight to nine pounds; while females weigh ten to 14 pounds.

The historic range of the bald eagle extended throughout North America, from central Alaska and Canada to northern Mexico. However, it experienced considerable decline in the south and eastern portions of its range during the 20th century. In the late 18th century, it is believed there were as many as 100,000 nesting bald eagles in the lower 48 states, but by1963, only 417 were known in this portion of the species range. There are about 40,000 bald eagles in Alaska and none in Hawaii. After banning DDT and implementing recovery actions under the ESA for over 30 years including: protecting/enhancing habitat, minimizing disturbance, monitoring contaminants (DDT), and reintroducing eagles, there are now more than 6,471 pairs of bald eagles nesting in the lower 48 states.

Life History

Bald eagles reach sexual maturity between four to six years of age, but may be older before they first attempt to nest and breed. They are believed to mate for life. Bald eagles have a relatively long life-span and have been known to live up to 48 years in captivity and 28 years in the wild (USFWS 1983a).

Fish are the major item of the bald eagle's diet. Eagles often catch fish while flying by swooping down on them as they swim near the water's surface and snatching them up with their sharp talons. Therefore, bald eagles spend much time roosting and foraging near large water bodies where fish abound. They also feed on waterfowl, particularly those dead, crippled, or otherwise vulnerable. At some locations, often during the winter period when eagles may be away from open water, mammals that can easily be caught or scavenged may be part of the eagle's diet (USFWS 1983a). Bald eagles may fly up to 40 mph during normal flight, but they can reach speeds of 100 mph when diving for prey. Bald eagles have few natural predators.

Bald eagles generally build their nests in trees along or near their primary foraging areas, i.e., large bodies of water such as lakes, large rivers and the ocean. Their massive nests are largely composed of small tree branches placed in the crotch of a large, open-branched tree, but at in some areas they may also nest on cliffs, or very rarely on the ground. Bald eagles often prefer the largest tree in their breeding area. Adult bald eagles will often use the same breeding area during different nesting seasons. A "breeding area" is the local area associated with one territorial pair of eagles, and containing one or more nest structures. Bald eagles will also often reuse nests in subsequent years. These birds often build and use new nests near a previous nest, and several nests may accumulate in an area, although only one is used during the nesting season. With additions to the nests made annually, some may reach 10 feet across and weigh as much as 4,000 pounds. Clutch size ranges from one to three eggs. Adults will raise one to three young, the average being just above one eaglet per nesting attempt. Although bald eagles may range over great distances, they usually return to nest within 100 miles of where they were raised or hacked themselves.

Breeding and nesting phenology depends primarily on latitude. Prior to egg-laying, bald eagles engage in courtship activities and nest building. Courtship activities can involve both calls and aerial acrobatics, such as cartwheels, swoops, and chases. Nest building and refurbishing can take place prior to courtship, even during the previous fall. During courtship and the incubation period, the eagles are most intolerant of external disturbances and may abandon the area. The most critical period for disturbances, therefore, extends from approximately one month before egg laying through incubation. In Indiana, egg laying can occur as early as early February or March, and as late as early April. Eggs are laid every other day, and incubation takes approximately 35 days. After hatching, chicks are vulnerable to inclement weather and need frequent brooding and feeding. Natural or human-caused disturbances can keep adults from nests and, depending on the weather and length of time involved, may cause weakening or death of chicks. Adults are protective of the nest site as long as one or more healthy chicks are present. The young remain in the nest for about 10 – 12 weeks, and adults often care for the young for 6 weeks to 3 months after fledging. Prior to taking their first flight young eagles may “branch,” where they hop and climb out of their nest and into nearby tree branches while flapping and strengthening their wings. Young eagles typically leave the nest or “fledge” at 11 to 12 weeks of age. Young usually fledge from early June to mid-July in Indiana. The time between egg-laying and fledgling is approximately four months and the entire breeding cycle, from initial activity at a nest through the period of fledgling dependency, is about six months.

All bald eagles, whether tolerant or intolerant, are more susceptible to human disturbance at some times during the nesting season. In southern Indiana, bald eagles are most prone to human disturbances from December or January through May or June depending on how early an individual pair begins courting and egg-laying.

Most bald eagles in Canada and the northern U.S. migrate south in the fall; however, in temperate latitudes some remain with nesting areas throughout the year. This migration is probably a result of changes in prey availability and weather conditions. The period from November to March is referred to the “wintering period,” and may overlap the beginning of the nesting season in some areas (USFWS 1983a). Wintering bald eagles occur throughout the country, but are more prevalent in the West and Midwest. An adequate food supply and suitable night roost sites are the primary factors for appropriate winter habitat. Bald eagles use a much wider variety of habitat during winter than when nesting. Some wintering sites may be used multiple times, while others are only used once. Most wintering bald eagles are found near large bodies of water. However, some spend a large amount of time in terrestrial environments, away from a large water source. At night, wintering eagles may congregate at communal roost trees, and may travel from feeding areas to specific roost sites. Roost sites are often in locations that are protected from the wind by vegetation or terrain. These protected sites help minimize energy expenditures. Human disturbance to a roost site may cause the bald eagles to abandon it (USFWS 1983a).

FANSHELL MUSSEL

The Federally endangered fanshell mussel (*Cyprogenia stegaria)* was included in the species list as potentially occurring in the project area and was analyzed in the Tier 1 BA for I-69. In the BA, the FHWA determined that I-69 from Evansville to Indianapolis was not likely to adversely affect fanshell mussels because previous surveys at the proposed crossing of the East Fork of the White River revealed that the habitat was not suitable and no live or dead mussels were found in the vicinity of the crossing. Because the Service has concurred with their “not likely to adversely affect” determination (letter dated July 21, 2003), the fanshell mussel will not be considered further in this consultation unless new information or changes to the proposed action warrant reinitiating consultation for this species.

III. ENVIRONMENTAL BASELINE

This section is an analysis of the past effects of State, tribal, local and private actions already affecting the species within the Action Areas and the present effects within the Action Areas that will occur contemporaneously with the consultation in progress. It includes a description of the known status of Indiana bats and bald eagles and their habitats within or near the I-69 Action Areas.

The natural environments traversed by the Action Areas are summarized below. Additional information available in the I-69, Evansville to Indianapolis, Indiana, Tier 1 DEIS is hereby incorporated by reference.

Physiographic Regions

Physiographic regions are areas that have similar topography and land use. Physiographic regions provide a general view of the terrain, and resources that may be affected by the proposed Interstate. The preferred alternative, Alternative 3C, traverses portions of seven physiographic regions: **Wabash Lowland, Boonville Hills, Crawford Upland, Mitchell Plateau, Norman Upland, Martinsville Hills, and New Castle Till Plains & Drainageways** (Figure 8).

The proposed Interstate crosses the **Wabash Lowland** in portions of Gibson, Warrick, Pike, Daviess, and Green counties. Approximately 44% of the length of the Interstate (62 miles) is in this region. It is flat to rolling with wide expanses of alluvial land, some of which is lacustrine in origin. The Wabash Lowland is the largest of the southern Indiana regions and was completely covered by the Illinoian Glacier. Land use is essentially agricultural, some forest land (mostly floodplain forests), extensive wetlands (e.g. Pigeon Creek and Patoka River bottoms), and coal mining. Agriculture is the dominant land use, with over 61% of the area devoted to farming. Approximately 22–25% of the land is forested, while the remaining land area has urban and miscellaneous uses. Approximately 87% of forests are owned by farmers and private individuals. The remaining forests are owned by federal, state, county, municipal agencies, and/or timber companies.

Only a small portion in Gibson and Pike counties, 3% (4 miles), of the proposed Interstate crosses the **Boonville Hills Region**. This region is slightly hillier than the adjacent Wabash Lowland, possibly because it was not glaciated. Strip mining has been extensive in this region, and there are large areas of reclaimed or modified land in the eastern portion (Gray 2000). Land use in the Boonville Hills includes farmland, forest, and mining.

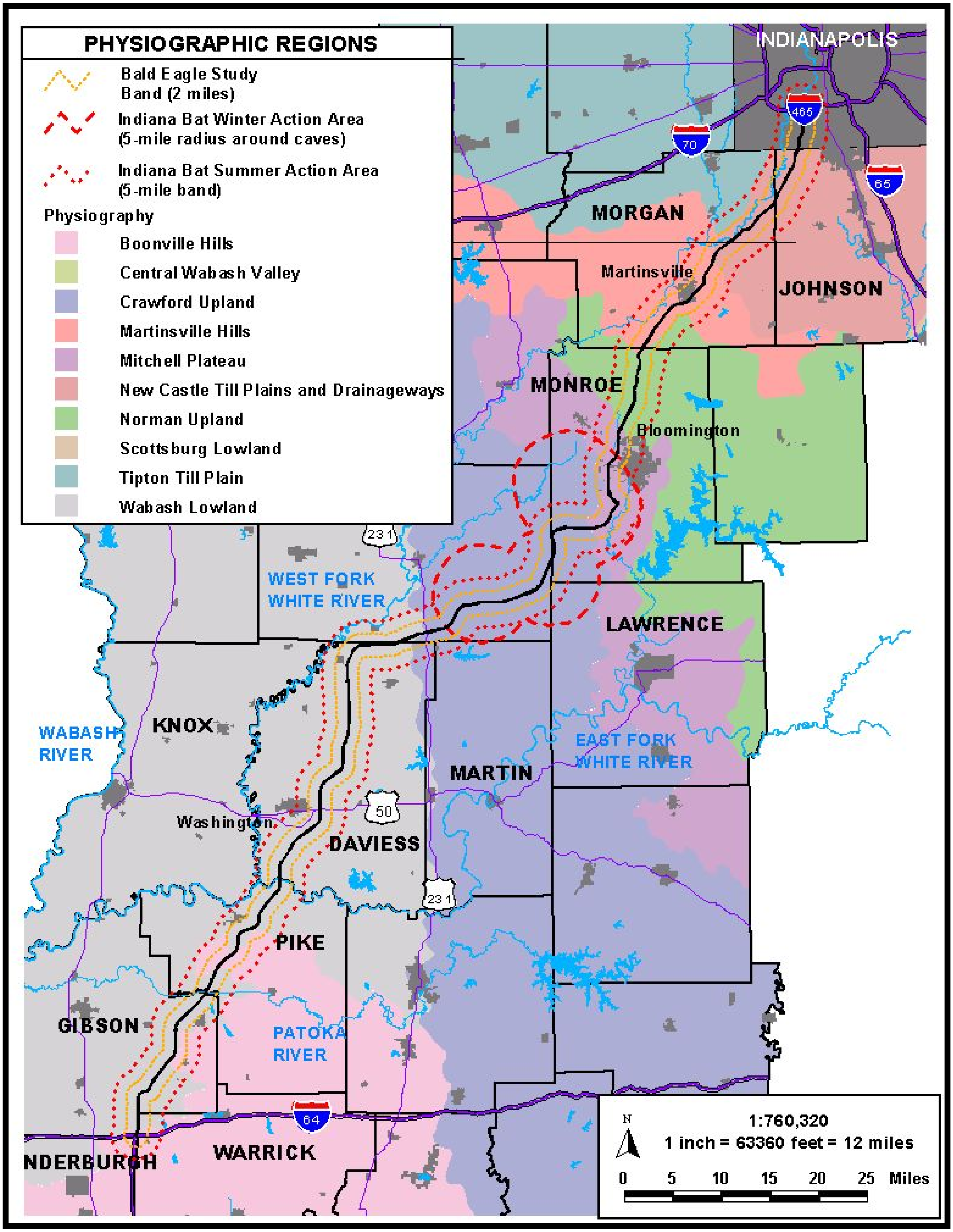

Figure 8. Physiographic regions (Gray 2000) and species Action Areas for the proposed I-69.

Approximately 16.5% (23 miles) of the alternative is within the **Crawford Upland Region**, primarily in Greene and Monroe counties. This region is largely unglaciated and is a rugged highland with varied elevations and v-shaped valleys with sharp ridges to u-shaped valleys with rounded ridges. Karst terrain, containing sinkholes and caves, is common. Land use is approximately 43% cropland, 20% pasture, and 28% woodland. Approximately 71% of the forests are owned by farmers and private individuals.

East of the Crawford Upland is the **Mitchell Plateau**. Approximately 9% (13 miles) of the proposed alternative is within this region, in Monroe County. This region is a limestone, somewhat flat to rolling plain, with many caves, sinkholes and continuous tracts of forests. There is extensive karst topography west of Bloomington. Approximately 61% of forests are owned by farmers and private individuals. Livestock, crops, timber, and limestone are this region's main commercial resources.

Approximately 9% (13 miles) of the proposed alternative is within the **Martinsville Hills Region** in Morgan County. This is a relatively small region within the study area, and more rugged than the adjacent Tipton Till Plain region to the north. The eastern and western parts of this region are more rugged than the central, which contains lacustrine and till plain areas (Gray, 2000). Predominate land use includes farmland and forest.

Approximately 5.5% (8 miles) of the proposed Interstate traverses the **Norman Upland**, in Monroe and Morgan counties. This upland region contains great local relief due to stream action over a long period of time. This resulted in long, sharp ridges, and v-shaped valleys, which in turn create rugged, picturesque hills. Prime examples of this scenic landscape are found in Brown County (Mumford and Whitaker 1982).

Finally, approximately 13% (18 miles) of the proposed Interstate passes through the **New Castle Till Plains & Drainageways** in Johnson and Marion counties. This region is a relatively flat glacial plain. It is distinguished by the number of valleys that cross it in a southerly to southeasterly radial pattern. These valleys fed the White River, the East Fork of the White River and several of its tributaries, and several forks of the Whitewater River (Gray 2000). Farmland is the predominant land use in this region.

Natural Regions

In addition to physiographic regions, the land can be categorized by natural regions. A natural region is a major, generalized unit of the landscape with a distinctive assemblage of natural features. It is part of a classification system that integrates several natural features, including: climate, soils, glacial history, topography, exposed bedrock, presettlement vegetation, species composition, physiography, and flora and fauna distribution. A "section" is a subunit of a natural region where sufficient differences are evident, such that recognition is warranted (Homoya et al. 1985). Natural regions are similar to physiographic regions, but while physiographic regions may give information on predominant land use, natural regions may give more information about native plant and animal species. Some natural regions have a similar corresponding physiographic region, while some may be unique to the classification system.

The proposed 3C corridor of I-69 crosses five natural regions: **Southwestern Lowlands, Southern Bottomlands, Shawnee Hills, Highland Rim**, and the **Central Till Plain**. Within these five natural regions, the Interstate crosses nine sections: **Driftless, Southern Bottomlands, Glaciated, Plainville Sand, Escarpment, Mitchell Karst Plain, Brown County Hills**, and **Tipton Till Plain** (Figure 9). The following natural region section descriptions come from "The Natural Regions of Indiana," by Homoya et al. (1985).

The **Southern Bottomlands Section** is the only section within the **Southern Bottomlands Natural Region**. Approximately 8% (11 miles) of the proposed Interstate crosses this section, primarily in Gibson and Pike counties. This natural region includes the alluvial bottomlands along rivers and larger streams of southwestern Indiana. The soils are mostly neutral to acid silt loams and much of the area is subject to frequent flooding. Natural communities of the region include bottomland forest, swamp, pond, slough, and former marsh and prairie. Bottomland forest, the major community type of this region, is characterized by pecan, sugarberry, swamp chestnut oak, pin oak, swamp white oak, red maple, silver maple, honey locust, catalpa, shellbark hickory, sycamore, and green ash. Swamp and slough communities are characterized by bald cypress, swamp cottonwood, water locust, pumpkin ash, and overcup oak. Other distinctive species (many of which are restricted to this region) include American featherfoil, bloodleaf, acanthus, climbing dogbane, catbird grape, woolly pipe-vine, swamp privet, American snowbell, climbing hempweed, spiderlily, mistletoe, and giant cane. Distinctive southern animals include cottonmouth, hieroglyphic turtle, diamondbacked watersnake, eastern mud turtle, northern copperbelly, swamp rabbit, mosquitofish, harlequin darter, and yellow-crowned night heron.

The **Southwestern Lowlands Region** includes the **Driftless Section, the Glaciated Section,** and the **Plainville Sand Section**. The Southwestern Lowlands Region is characterized by low relief and extensive aggraded valleys. This region, except for the southern portion, was covered by the Illinoian Glacier. Much of the region is nearly level, undissected, and poorly drained, although in some areas the topography is hilly and well drained.

Approximately 12% (17.5 miles) of the proposed Interstate is within the **Driftless Section,** primarily in Gibson and Pike counties. This section is south of the Illinoian glacial border, and is characterized by low hills and broad valleys. This area has the longest growing season and highest average summer temperature in the state. Natural communities include upland forest, occupying the well-drained slopes, and southern flatwoods occupying lacustrine plains and river terraces. Flatwoods species include cherry bark oak, sweetgum, shellbark hickory, pin oak, swamp white oak, Shumard's oak, green ash, black gum, and locally, post oak. Upland forests of this section are relatively dry communities dominated by oaks and hickories. Other natural communities include marsh, swamp, sandstone cliff, and low to medium-gradient stream. Soils in this section are predominately acidic.

The **Glaciated Section** is also part of the Southwestern Bottomlands Region. Approximately 24% (34 miles) of the alternative passes through this section, in portions of Pike, Daviess, and Greene counties. Natural communities in this section are mostly forests, but several types of former prairie are known. The flatwoods community is common, but species composition differs from the Driftless Section. Common flatwoods species in this section include shagbark hickory, shellbark hickory, pin oak, shingle oak, hackberry, green ash, red maple, and silver maple. Black ash swamps are near their southern limit in this section. This section also appears to have the largest amount of prairie south of the Wisconsinan glacial border in Indiana; however, little is known about the composition of this prairie. Additional community types include: swamp,

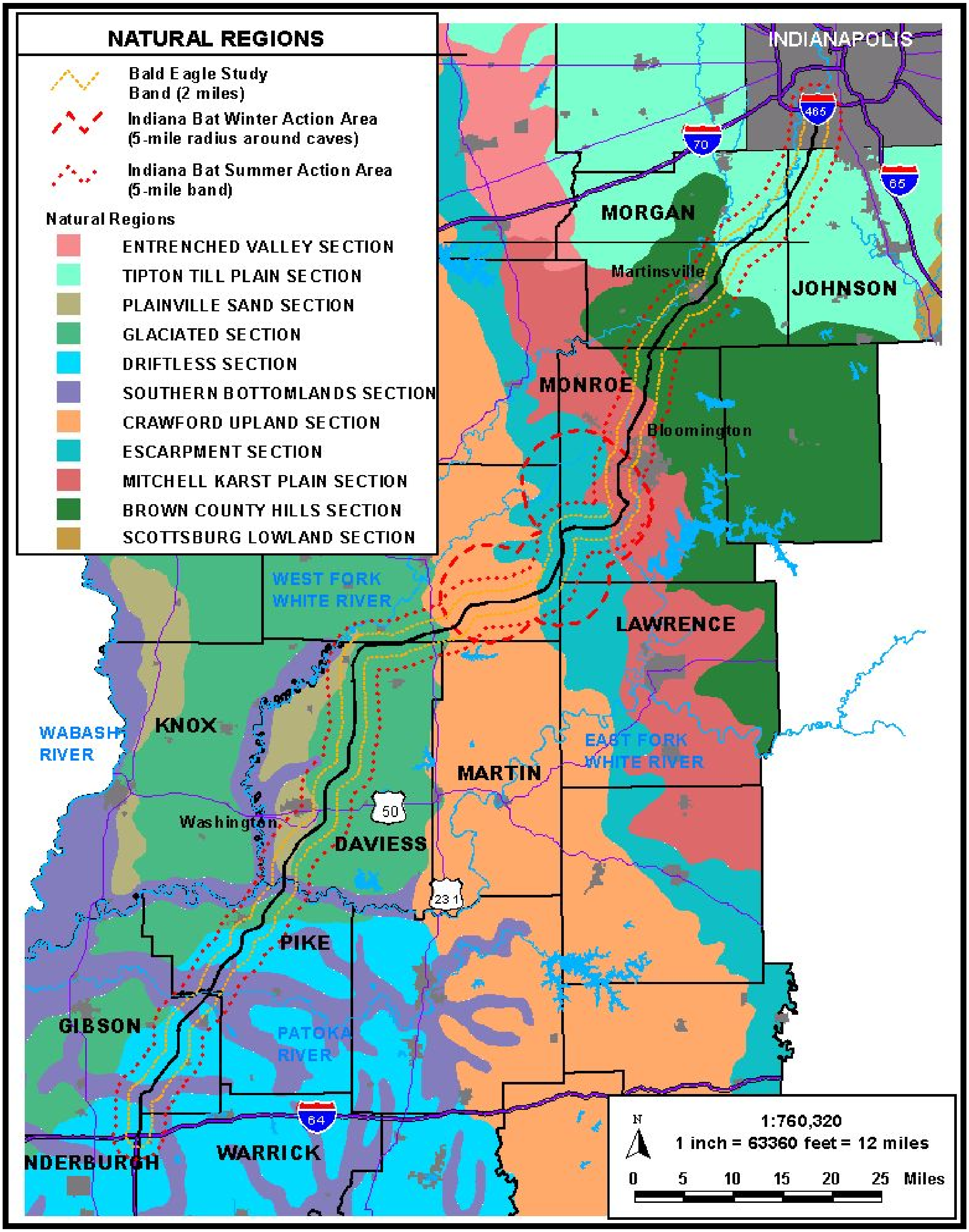

Figure 9. Natural regions (Homoya et al. 1985), species Action Areas, and proposed I-69.

marsh, pond, and low-gradient stream. The prairie kingsnake and the crawfish frog are characteristic animal species of this region.

Approximately 4% (5 miles) of the proposed Interstate traverses the **Plainville Sand Section** in Daviess County**,** also in the Southwestern Bottomlands Region. This section is a small, but unique, area of wind-blown sand dunes east of the Wabash and White Rivers. Soils are sandy and acidic. The barrens natural community, now almost gone from the landscape, predominated on the ridges and well-drained areas, and swamp, marsh, and wet prairie occupied the swales. The barrens vegetation consisted mostly of prairie species, along with some western and southern sand-dwelling species, including beard grass, Carolina anemone, tube penstemon, clustered poppy-mallow, hairy golden aster, narrowleaf dayflower, black hickory, adrosace, rose gentian, sedge, and fleabane. In a few areas, barren vegetation, including little bluestem, big bluestem, Indian grass, side-oats grama, New Jersey tea, and blackjack oak, can still be seen. Animal species restricted to the geographic area include the bull snake, ornate box turtle, and six-lined racerunner.

The **Shawnee Hills Natural Region** includes the **Crawford Upland Section** and the **Escarpment Section**. This natural region appears to represent general presettlement conditions better than any other terrestrial region in the state. It is a rugged and generally sparsely populated area. Most natural communities are upland forest, although a few sandstone and limestone glades, gravel washes, and barrens are known.

Approximately 7% (10.5 miles) of the preferred alternative is within the **Crawford Upland Section**, in Greene County. This section of the Shawnee Hills Natural Region contains rugged hills with sandstone cliffs and rockhouses. The soils are characteristically well drained acid silt loams. Forest vegetation consists of an oak-hickory assortment on upper slopes, while coves have a mesic component. Characteristic upper slope species include black oak, white oak, chestnut oak, scarlet oak, post oak, pignut hickory, small-fruited hickory, shagbark hickory, and rarely, sourwood. Characteristic species of cove forests include beech, tulip tree, red oak, sugar maple, black walnut, white ash, and locally, yellow buckeye, white basswood, hemlock, yellow birch, and umbrella magnolia. The sandstone cliff and rockhouse communities provide environments for several species with Appalachian affinities, including mountain laurel, mountain spleenwort, sourwood, and umbrella magnolia. Distinctive species associated with rockhouses include filmy fern, alumroot, Bradley’s spleenwort, French’s shooting star, and the Appalachian gametophyte. There are a few spring communities, a type extremely rare in Indiana. Vegetation characteristic of these communities include cinnamon fern, royal fern, sedges, small clubspur orchid, black chokeberry, winterberry, tearthumb, jewelweed, crested wood fern, and *Sphagnum* spp. The barrens community is, and probably was, a minor component of this section, and only a few remnants remain. Sandstone glades are very rare in Indiana, but at least two are known in this section. Characteristic species in sandstone glades include: bluestem, slender knotweed, poverty grass, farkleberry, goat’s rue, pineweed, pinweed, and panic grass. Two interesting mammals in this section are the smoky and pygmy shrews.

Approximately 9% (12 miles) of the proposed Interstate crosses the **Escarpment Section** of the Shawnee Hills Natural Region in portions of Greene and Monroe counties. This section includes rugged hills along the eastern border of the region. Sandstone and sandstone- derived soils are found on hill tops, and limestone and limestone-derived soils are present at lower elevations. Karst features are common, especially in the lower and middle elevations. Natural communities in this section consist of various upland forest types, especially dry-mesic and mesic. Species composition is similar to the Crawford Upland Section, except certain species, such as post oak and black oak, commonly replace chestnut oak on dry sites; and some of the mesic cove species, especially those with Appalachian affinities, are absent. Limestone glades and barrens occur in this section, but are more common in the Highland Rim Natural Region. Limestone cliff communities occur at the southern end of this section. Rare species such as alumroot, wall-rue spleenwort, cleft phlox, wild liveforever, and black-seeded sedge can be found in the limestone cliffs. Eastern woodrats live in the crevices of cliffs along the Ohio River, which is also a roosting site for the black vulture. Caves are also common. They support unique animal species such as the troglobitic crayfish and northern cavefish. Some caves support populations of hibernating bats, including the federal and state endangered Indiana bat. Limestone gravel wash communities are found in this section, and the wild blue indigo is apparently confined in Indiana to these communities. Typical aquatic features include normally clear, medium and high-gradient streams, springs, and sinkhole ponds.

The **Highland Rim Natural Region** within the study area includes the **Mitchell Karst Plain Section** and the **Brown County Hills Section**. This natural region is unglaciated, except relatively unmodified glaciated areas at the northern and eastern boundaries. A distinctive feature of this region is the large expanse of karst topography, although several other major topographical features are also present, such as cliffs and rugged hills. Much of the area was forested in presettlement times, but large barrens, small glades (limestone and siltstone), and gravel wash communities also occurred.

Approximately 11% (15 miles) of the proposed Interstate crosses the **Mitchell Karst Plain Section** of the Highland Rim Natural Region, in Monroe County. The major feature of this section is the karst (sinkhole) plain. Several natural community types are associated with this plain, including caves, sinkhole ponds and swamps, flatwoods, barrens, limestone glades, and several upland forest types. The plain is relatively level, although in some areas, especially near the section's periphery, limestone cliffs and rugged hills are present. Caves are common. The soils are generally well drained silty loams derived from loess and weathered limestone. Possibly the largest area of barrens in Indiana was located in this section. Species commonly found in remnants of this prairie-like community include Indian grass, big bluestem, little bluestem, rattlesnake master, prairie dock, hairy sunflower, prairie willow, clasping milkweed, and *Carex meadii*. Most of Indiana's limestone glades occur in this region, although most are in counties outside the study area. This bedrock community has a prairie flora with additional distinctive species, including downy milk pea, angle-pod, axe-shaped St. John's wort, adder's tongue fern, crested coral root, orchid, and heartleaf Alexander. Gravel wash communities of limestone and chert border most streams. Characteristic species in these communities include big bluestem, Indian grass, Carolina willow, water willow, ninebark, pale dogwood, and bulrush. Karst wetland communities are the major aquatic feature of this section. Southern swamp species are known from some sinkhole swamps, including beakrush, log sedge, giant sedge, Virginia willow, small buttercup, and netted chain fern. Common dominants of these swamps are swamp cottonwood, pin oak, swamp white oak, red maple, and sweetgum. Sinkhole pond communities normally have open water and marshy borders with cattails, bulrush, bur-reed, spatterdock, buttonbush, swamp loosestrife, bladderwort, and *Carex comosa*. Several forest communities are also present in this section, but the western mesophytic forest type is most common. Species characteristic of this forest type include white oak, sugar maple, shagbark hickory, pignut hickory, and white ash. Near glade communities some xeric forest are characterized by post oak, chinquapin oak, and blue ash. In karst areas, surface streams are few, as most of the drainage is underground.

Approximately 11% (16 miles) of the proposed Interstate traverses the **Brown County Hills Section**, in Monroe and Morgan counties. It is the second section in the study area in the Highland Rim Natural Region. This section is characterized by deeply dissected uplands, underlain by siltstone, shale, and sandstone. The soils are well drained acid silt loams with minor amounts of loess. Bedrock is near the surface, but rarely crops out. Natural communities are rather uniform in composition, with uplands dominated by oak-hickory, especially chestnut oak, and ravines with mesic species, such as beech, red oak, sugar maple, and white ash. The yellowwood tree is known in Indiana, but only from a small area in this section. Small, high-gradient, ephemeral streams are common, and larger streams are usually medium to low-gradient.

Finally, the **Central Till Plain Natural Region** is the fifth natural region that comprises the I-69 study area. This region includes the **Entrenched Valley Section** and the **Tipton Till Plain Section**. The Central Till Plain Natural Region is the largest natural region in Indiana, and is a formerly forested plain of the Wisconsinan till in the central portion of the state. With the exception of the Entrenched Valley Section, the topography is homogenous, although glacial features such as moraines are common. The proposed Interstate does not pass through the Entrenched Valley Section, therefore it is not discussed further.

Approximately 14% (19 miles) of the proposed Interstate crosses the **Tipton Till Plain Section**, in potions of Morgan, Johnson, and Marion counties. This section is a mostly undissected plain formerly covered by an extensive beech-maple-oak forest. The soils are predominantly neutral silt and silty clay loams. The northern flatwoods community associated with these poorly drained soils was ubiquitous but now is confined to scattered woodlots. Species common within the community include red maple, pin oak, bur oak, swamp white oak, Shumard's oak, American elm, and green ash. In slightly better drained sites, characteristic species include beech, sugar maple, black maple, white oak, red oak, shagbark hickory, tulip poplar, red elm, basswood, and white ash. Other community types of this section include bog, prairie, marsh, seep, spring, and pond.

Major Drainages

Three major rivers are crossed by the 3C corridor: the East Fork of the White River, the Patoka River, and Pigeon Creek. The East Fork of the White River is the largest river that would be crossed between Evansville and Indianapolis. It is a slow-moving stream that drains approximately 5,700 square miles. The proposed location for the I-69 bridge is approximately 1.5 miles east or upstream of the existing SR 57 bridge, which spans the East Fork between Pike and Daviess counties. The Patoka River is approximately 100 miles long with an 860 square mile drainage basin. The proposed crossing of this river is within the acquisition boundary of the Patoka River National Wildlife Refuge. Much of this river has been dredged and straightened; however, the portion from about US 41 to the Wabash River is still natural and meandering. Pigeon Creek is a low-gradient stream with turbid waters. The proposed bridge crossing for Pigeon Creek is in Gibson County. This creek is classified as a legal drain and has been dredged in places to channelize the stream. The Indiana Department of Environmental Management (IDEM) has listed the Patoka River, southern portion of Pigeon Creek, and portions of the East Fork of the White River on the 2002 303(d) List of Impaired Waterbodies. Parameters of concern for the Patoka include PCBs and mercury. Parameters for concern in Pigeon Creek include PCBs, sulfates, TDS, pathogens, and low dissolved oxygen. The parameter of concern for the East Fork of the White River upstream of the project area is PCBs.

Karst Features

Karst features are especially common in the Mitchell Plateau and Crawford Upland physiographic/natural regions. The portion of Alternative 3C in Monroe County, and to a lesser extent Greene County, crosses karst terrain. The term “karst” refers to “landscapes characterized by caves, sinkholes, underground streams, and other features formed by the slow dissolving, rather than the mechanical eroding of bedrock” (American Geological Institute 2001). Because the underlying bedrock is easily dissolved by water, there is often a direct connection between surface and ground water. Little water purification occurs because the water flows directly through cracks and fissures rather than percolating slowly through the ground as in other types of terrain. Therefore, ground water resources are especially susceptible to degradation from pollution in karst areas. Pollution from both urban (e.g., untreated stormwater runoff, point-source dischargers/NPDES permits) and rural sources (e.g., residential septic systems, livestock waste, and agricultural pesticides) is an important concern in karst areas.

Caves often contain highly specialized ecosystems with distinct microclimates. Caves are not exposed to sunlight and the temperature of the cave varies due to air movement near the entrances, the location (on ridges or in valleys), and the temperature of water entering the cave.
Aquatic species that live in caves and karst terrain are especially sensitive to pollution because it is easily introduced to their environment via water flow with little filtering or dilution. However other species such as bats that only use caves during part of their life cycle (i.e., winter hibernation) also may be adversely affected by pollution entering caves or changes to a cave’s hydrology or temperature regime.

Karst habitat is a non-renewable resource that is biologically important because it provides habitat for a number of rare, threatened, and endangered species that depend of caves to different degrees. Troglobites are animals highly adapted to complete their entire life cycle in cave environments. Troglobitic species often include flatworms, isopods, amphipods, eyeless cave shrimp, cave crayfish, bristletails, eyeless cave fish, and cave beetles. Because food in caves is scarce, full time cave dwellers tend to be smaller, with lower metabolism and longer life spans than their surface counterparts. Troglophiles pass their life cycle within caves when sufficient food is present, or in dark, cool, moist environments just outside the cave. Examples of troglophiles include segmented worms, snails, copepods, spiders, salamanders, springfish, phalangids, mites, pseudoscorpions, millipedes, and cave crickets (*Hadenoecus*). Trogloxenes are species that use caves, but cannot complete their life cycles within them. Crickets, bats, pack rats, flies and gnats are trogloxenes. Many species of bats, including the Federally endangered Indiana bat, use caves in karst areas within the WAA of I-69. By collecting food on the surface and then returning to caves, trogloxenes play an important role in providing food (e.g., fecal matter) for cave animals that never venture outside. The life histories of all cave animals highlight the fragility and interconnectedness of the surface and the cave environments (NSS 2003).

Indiana Bats within the Action Area

Prior to the initial formal consultation for Tier 1 of I-69, no previous section 7 formal consultations involving Indiana bats have been conducted within the boundaries of the Indiana bat Summer or Winter Action Areas established for this project. However, numerous informal and a few formal consultations have occurred for this species within some of the same counties that will be traversed or in similar habitat located elsewhere within southern Indiana. In general, more detailed information is known about winter populations of Indiana bats in hibernacula within the WAA than summer populations in the SAA. However, the extensive mist netting surveys conducted in 2004 and 2005 by INDOT's biological consultants contributed greatly to the Service's knowledge of Indiana bat distribution and abundance along the 3C corridor.

Mist Net Surveys within the Summer Action Area

At the time of the initial formal consultation for Tier 1 of I-69, only one previous mist net survey had been conducted for Indiana bats near the proposed I-69 corridor. In 1993, Dr. John Whitaker, Jr., conducted mist net surveys for Indiana bats along INDOT's previously proposed Southwest Indiana Highway Corridor connecting I-64 to Bloomington, which basically followed the current Alternative 3C corridor of I-69. Although Dr. Whitaker surveyed areas he thought to have high quality summer habitat, he only captured Indiana bats at one of the 21 sites that was surveyed. That one site was located along the Patoka River near the proposed bridge crossing for I-69 and produced two lactating, female Indiana bats indicating a nursery colony was located nearby (Whitaker 1996). Therefore, there were only records of a single maternity colony within the I-69 SAA when FHWA and the Service conducted the initial formal consultation for Tier 1 of I-69.

Since the December 3, 2003 BO for Tier 1 of I-69 was issued, INDOT has completed numerous bat surveys as part of Tier 2. Between May 15, 2004 and August 15, 2004, a total of 148 mist net sites were surveyed within the SAA for the proposed I-69. This included 12 sites in Section 1, 30 sites in Section 2, 23 sites in Section 3, 30 sites in Section 4, 24 sites in Section 5, and 29 sites in Section 6. The net sites are depicted in Figure 1 (a large wall map) of the Tier 1 BA Addendum. These survey sites, approximately one site per mile of proposed interstate, were selected by FHWA, INDOT, and the BFO. Net sites included both upland and stream locations. Upland sites consisted of trails and roads bordered with forest, and forest corridors in pastures. Stream sites were located along streams with forested riparian zones or wetlands. Additional mist netting was conducted at 49 sites between July 12, 2005 and August 15, 2005. This includes six (6) sites in Section 1, 12 sites in Section 2, six (6) sites in Section 3, 15 sites in Section 4, three (3) sites in Section 5, and seven (7) sites in Section 6. The additional mist net sites are shown on the I-69 Evansville to Indianapolis Indiana Bat Survey map (Figure 1 of BAA). The majority of these sites were the same as or near those surveyed in 2004. The additional mist netting was conducted at or near survey sites from 2004 that produced a reproductively active female or juvenile that could not be successfully tracked to a roost tree. To our knowledge, this was the largest mist net survey for bats ever conducted within the range of the Indiana bat for a proposed transportation project and possibly any federal project or program.

A total of 55 Indiana bats was captured in 2004 (n=48 bats) and 2005 (n=7 bats) and 34 of these bats were radio-tagged and tracked to a total of 32 roost trees/sites. The 55 Indiana bats included, 21 reproductively active (i.e., pregnant, lactating, or post-lactating) adult females, 8 non-reproductive adult females, 7 juveniles (i.e., young of the year), and 19 adult males. Reproductive females were captured in each of the six sections of the I-69 SAA and adult males were captured in all the sections except Section 1.

Roost Trees Identified within the Summer Action Area

Of the 32 roosts identified, eight (8) were primary roosts and 24 were secondary roosts. A primary roost is defined as a roost with 30 bats or greater observed during emergence counts. A secondary roost, or alternate roost, is a roost with less than 30 bats observed during emergence counts. Of the roosts identified, one (1) was a sugar maple (live), six (6) were shagbark hickory , five (5) live and one (1) dead), nine (9) were silver maple (six (6) live and three (3) dead), one (1) cottonwood (dead), five (5) elm (all dead), one (1) ash (dead), one (1) tulip poplar (live), five (5) dead trees of unknown species, one (1) bridge, and two (2) utility poles.

The dbh for the roosts ranged from 6.9 inches to 30.0 inches, with an average of 16.3 inches with a standard deviation of 6.9 inches. The dbh for primary roosts ranged from 10.0 inches to 25.5 inches, with an average of 15.3 inches and standard deviation of 5.1 inches. The dbh for secondary roosts ranged from 6.9 inches to 30 inches, with an average of 16.6 inches and standard deviation of 7.5 inches. In this case, it was atypical that the average diameter of the eight primary roost trees was actually smaller than the average diameter of alternative roost trees. Primary roosts are typically found in some of the largest dead trees available and alternates in smaller trees. The cause of this atypical result is unknown.

The percent of exfoliating bark ranged from 0% to 85%. The percent of exfoliating bark for primary roosts ranged from 0% to 70%, and for secondary roosts ranged from 0% to 85%. The percent of canopy closure ranged from 0% to 100%. The percent of canopy closure for primary roosts ranged from 0% to 75%, and for secondary roosts ranged from 0% to 100%. Only five (5) of the roosts identified were in upland locations, the remaining 26 were in riparian locations.

Distances from the roosts to the I-69 corridor range from zero (0) miles to 2.6 miles. The average distance was one (1) mile with a standard deviation of 0.7 miles. Only one (1) Indiana bat roost tree was identified within the 2000-foot wide I-69 corridor. This roost tree was a 14-inch dbh dead ash tree in a riparian corridor east of existing SR 37 in Section 6 near Martinsville. Additional detailed results of the mist net surveys and associated radio-tracking, roost trees, and roost emergence survey efforts are provided in the Tier 1 BA Addendum and numerous Tier 2 survey reports and are hereby incorporated by reference.

Bridge Surveys for Roosting Bats

Concurrent with the mist net surveys in 2004 and 2005, a total of 259 bridges within the SAA were inspected in order to identify Indiana bat night-roosting sites. This included 54 bridges in Section 1, 68 bridges in Section 2, 40 bridges in Section 3, 66 bridges in Section 4, 13 bridges in Section 5, and 18 bridges in Section 6. Bridges and culverts within the proposed alignment, and along existing and connecting roads were inspected. In most cases bridges were selected prior to field work by INDOT, FHWA, and USFWS; however, some were added upon field reconnaissance. Ten (10) bridges originally identified were not inspected because they had been removed, were under construction, or were small culverts. Bridges were checked for the presence of guano and roosting bats during nighttime hours. Morphometric data was collected on roosting bats and the habitat surrounding each bridge was generally characterized.

Indiana bats were discovered roosting at only one (1) of the 259 bridges surveyed. This bridge was located in Section 3. This bridge is not specifically named in this document or the BA Addendum for sensitivity reasons. On August 13, 2005, a total of 501 bats of several species including 9 Indiana bats was found day-roosting beneath this bridge. It was also used as a night roost for small numbers of Indiana bats and hundreds of other bats. Both the north and south sides of this bridge showed obvious signs of ongoing human activity and vandalism, such as garbage and spray-painted graffiti. [To prevent disturbance or harassment to the Indiana bats and other bats species roosting beneath this bridge, INDOT proposed to fence both the north and south sides of the bridge as a Conservation Measure for the I-69 project and completed this task in March 2006].

Maternity Colonies within the Summer Action Area

At the time of the December 2003 formal consultation for Tier 1 of I-69, only one maternity colony was known in the SAA near the Patoka River. However, based upon a spatial analysis of the 2004 and 2005 mist netting, radiotelemetry, and emergence count efforts, the Service, in informal consultation with INDOT and FHWA, determined that there were 13 Indiana bat maternity colonies with roosting/foraging areas within the I-69 SAA. A maternity colony typically consists of reproductively active female Indiana bats and their young (i.e., typically 1 pup/adult female/year). A maternity colony was determined to exist if there was evidence of reproduction in an area during the summer reproductive season (the capture of a reproductive female or juvenile, or high emergence counts at an identified roost). Each maternity colony's roosting and foraging area was assumed to fall within a circle with a 2.5-mile radius centered on primary roosts, placed between multiple roosts, or centered on mist net sites of Indiana bat capture if no roosts were identified. These 13 maternity colonies had not been identified and were not included in the original Tier 1 BA. The Service believes it is unlikely that additional, unidentified maternity colonies (beyond the 13 known colonies) exist in the portion of the SAA that will be directly impacted by I-69. If present, members of any other maternity colonies are assumed to occur along the periphery of the SAA and well beyond the reach of any significant direct or indirect effects from I-69.

The 13 maternity colonies have been named after an associated river or stream. They are listed below and the locations or their 2.5-mile areas in relation to the I-69 corridor are shown in Figure 4.

Colony Number	I-69 Section Number	Colony Name
1.	1	Pigeon Creek Maternity Colony
2.	2	Patoka River Maternity Colony
3.	2	Flat Creek Maternity Colony
4.	2	East Fork Maternity Colony
5.	2	Veale Creek Maternity Colony
6.	3	West Fork - Elnora Maternity Colony
7.	4	Doans Creek Maternity Colony
8.	4	Plummer Creek Maternity Colony
9.	4	Indian Creek Maternity Colony
10.	5	West Fork - Bryant Creek Maternity Colony
11.	6	West Fork - Clear Creek Maternity Colony
12.	6	West Fork - Crooked Creek Maternity Colony
13.	6	West Fork - Pleasant Run Maternity Colony

The Indian Creek Maternity Colony in Section 4 was initially identified by a radiotagged male Indiana bat. The radiotagged male was tracked to a conduit tube on the side of a utility pole in a residential yard in the summer of 2004. Biologists conducting emergence counts of bats at this utility pole observed from eight (8) to 20 bats emerge on six (6) different nights. Because emergence counts do not identify bats to sex or species, it was uncertain if the male Indiana bat was roosting with other male Indiana bats, bats of other species, or female Indiana bats. If the male was roosting with female Indiana bats, this roost could be a potential Indiana bat maternity colony. Due to the uncertainty and uniqueness of this roost, fecal DNA analysis was performed on guano samples collected from the utility pole. The goal of the DNA analysis was to determine the sex and species of bats roosting on the utility pole. The DNA analysis was performed by Dr. Maarten Vonhof from the Department of Biological Sciences at Western Michigan University.

Guano samples were collected from various heights within the plastic covering of the utility pole. DNA analysis was conducted on 20 pellet samples. The results showed all 20 samples to be *Myotis sodalis* (Indiana bat). Of these 20 samples, eight (8) were female and eight (8) were male. Four (4) of the samples could not be determined to sex. The DNA analysis showed that both male and female Indiana bats were roosting in the utility pole. The results of the DNA can be found in a report titled, "Molecular Species and Gender Assessment of Bats Utilizing a Roost Near an Interstate Expansion Project." Due to the presence of the both male and female Indiana bats roosting on the utility pole, this area was included in the analysis as the Indian Creek Maternity Colony.

The Tier 2 discovery of these 13 "new" maternity colonies within the SAA was one of the primary impetuses for the Service recommending that FHWA consider reinitiating formal consultation for Tier 1 of I-69. These 13 maternity colonies represent 15% of the known Indiana bat maternity colonies in Indiana (n=83) and 5% of the currently known maternity colonies within the range (n=246 colonies; see Table 4). Assuming there may be a total of 2900 maternity colonies throughout the species' range (see Table 5), then these 13 maternity colonies would represent less than one half of 1% (0.45%) of the total number.

Maternity Colony Population Size Estimates

When feasible, emergence counts conducted at roost sites as part of Tier 2 studies were used to determine minimum colony size estimates. Maternity colony size estimates for the nine (9) colonies where estimations were feasible ranged from 11 to 128 bats with an average minimum colony size of 59 bats. Because it is practically impossible, cost prohibitive, and highly disruptive to capture and radio-tag all colony members, locate all of their roost trees and have a large enough field staff to conduct simultaneous emergence counts at every roost trees, **the Service has decided to conservatively assume that each maternity colony is comprised of 80 adult females and their single offspring**. **This would result in a maximum of 160 bats per colony by mid- June when the young are born and when they become volant (i.e., capable of flight) around mid-July.** The Service believes an 80-adult female colony size is a reasonable assumption based on the minimum colony estimates generated during I-69 Tier 2 studies, other Indiana bat studies within Indiana, and the concurrence of other Indiana bat experts (see Whitaker and Brack 2002). To be conservative towards the bats, we are assuming that 100% of adult females will successfully bear a live pup and that 100% will survive to volancy, which is probably higher than reality, but gives the benefit-of-the doubt to the species. The actual reproductive rate of adult females in each maternity colony is unknown as is the current mortality rate of adults and juveniles.

Because only eight (8) non-reproductive females were captured during the 2004 and 2005 mist net surveys and all of these females were captured within three maternity colony areas in Section 2 (Patoka River, Flat Creek, and Veale Creek), it is likely that they were associated with these colonies. In fact, it was the radio-tracking of some of these "non-reproductive" females that lead to the discovery of the primary and alternate roost trees for the Patoka and Veale Creek colonies. Because, these females were captured late in the summer survey season (August), we assume that they actually had been reproductive earlier in the summer, but could no longer be clearly identified as being such by the biologists. The field biologist that had captured these bats in Section 2 concurred that our assumption was reasonable (pers. comm., with M. Gilley, ESI Inc.,T 2004). **Based on these results, the Service is assuming that all nonreproductive females in the SAA are associated with one of the 13 identified maternity colonies and are thereby being accounted for within the 80 adult females being estimated per maternity colony. Therefore, given the documented presence of 13 maternity colonies in the SAA and an approximate total of 160 females and their pups per colony, then we can assume that there are a combined total of approximately 2,080 (13 x 160 = 2,080) adult females (n=1,040) and juveniles (1,040) within or adjacent to the defined SAA and that variable proportions of the bats in these colonies are likely to be exposed to direct and/or indirect effects from I-69.**

Adult Males within the Summer Action Area

A total of 19 adult male Indiana bats was captured during the 2004 and 2005 mist net surveys within the entire 142 –mile long SAA. Over two-thirds (n=13, 68%) of the 19 males were captured in Sections 4 and 5. This was anticipated, because Sections 4 and 5 contain multiple hibernacula and the majority of male Indiana bats tend to remain relatively close to their hibernacula during the summer. In fact, the majority of the adult males were captured within the boundaries of the WAA. While the exact number of adult males that occur with in the SAA cannot be determined we can make a reasonable estimate of how many may reside within the WAA during the summer by using several logical assumptions. In the winter of 2005, biologists estimated that approximately 74,042 Indiana bats hibernated with the WAA (including 54,325 in Cave + 19,717 from Table 16 of BA Addendum). If we assume a 50:50 sex ratio, then half of these bats or 37,021 should be adult males. If half of these males remain in forested habitat within 5 miles of their hibernaculum (i.e., the WAA), then there would be 18,510 adult male Indiana bats occupying the 143,948 acres of forested habitat ("tree cover" data) within the WAA during the summer, which equates to approximately 0.13 adult males per acre of tree cover (we are assuming an even distribution of male bats within the WAA). For the portion of the I-69 SAA that extends north and south of the WAA (see Figure 4), we will assume the density of adult males is half of what it is within the WAA in summer or 0.065 adult males per acre of forested habitat. Therefore, we assume there is an approximate total of 5,256 adult male bats in the SAA (80,866 acres of forest x 0.065 bats/acre = 5,256 bats).

General Habitat Conditions

According to the Tier 1 BA Addendum, FHWA and INDOT estimated that the representative alignment for I-69 would directly impact approximately 2,148 acres of forest (2048 ac. upland forest and 100 ac. forested wetland) and approximately 20 acres of non-forested wetlands (5 ac. scrub/shrub and 15 ac. emergent). At this point in time, limited or no field studies have been conducted to determine the relative quality or general condition of the forested areas or wetlands (in regards to Indiana bat habitat) that will be directly impacted. We anticipate this type of information will be included in Tier 2 BAs. Nevertheless, the following generic description of the existing habitat is believed to be representative of much of the project area.

The native forest communities that once dominated the majority of southwestern Indiana are now largely confined to scattered woodlots, especially in the relatively flat, glaciated areas, which largely have been converted to agricultural land uses. Within the species action areas, agriculture, residential and commercial development, and transportation infrastructure have resulted in extensive clearing and construction. Agriculture and forest land uses dominant much of the landscape. In addition, remaining natural habitats (e.g., forests and wetlands) and previously converted agricultural lands are now widely being converted for commercial and residential developments, especially near larger cities such as Washington, Bloomington, Martinsville and Indianapolis. Vegetation adjacent to most rivers, streams, and tributaries that will be crossed by I-69 includes row crops, pasture, old fields, and patches of riparian forest. Within the northern and southern ends of I-69 corridor, much of the relatively high quality wildlife habitat is commonly associated with river and stream corridors and associated strips and small blocks of riparian forests. In addition to riparian forest vegetation, isolated woodlots also occur within the project area and a few larger areas that are managed as forest habitat (e.g., Morgan-Monroe State Forest, Crane Naval Surface Warfare Center). Many livestock pastures, and some grassy and brushy areas with widely scattered mature trees and tree-lined fencerows also provide limited wildlife habitat and potential travel corridors for bats.

Baseline for the SAA and Maternity Colonies
According to an updated version of Table 8 in the Tier 1 BA (provided by BLA), the entire SAA encompasses a total of approximately 462,903 acres (excluding the 13 maternity colony areas), of which 141,915 acres or 31% is forested. Estimated forest cover within each project section is summarized below in Table 6. **The Service will use the forest data summarized in Table 6 as an approximate baseline of currently existing forest habitat available within the entire SAA**, and assume that all of the forest habitat within the SAA, approximately 141,915 acres, is of moderate to high quality for roosting and foraging by Indiana bats. We believe this is a reasonable assumption given that the project is within the core of the Indiana bat's maternity range and that we know from personal observations that many areas of high quality habitat are scattered throughout the 3C corridor.

Table. 6. Estimated amount of forest within the SAA of each Project Section of Alternative 3C of I-69.

Project Section Number	Total Acres within Summer Action Area	Total Forested Acres within Summer Action Area	Percent of the SAA within each Project Section that is Forested	Percent of Total Forest within each Project Section
1	45,985	8,057	17%	6%
2	89,912	18,022	20%	12%
3	80,972	8,718	11%	6%
4	85,755	53,714	63%	38%
5	71,523	33,447	47%	24%
6	88,346	19,957	23%	14%
Totals:	462,903	141,915	31%	100%

Key parameters that may affect the quality of the summer habitat for bats within the action area are the overall percentage of forest cover in a specified area, the size of existing forest patches, and the degree of connectivity among forest patches. Based on a thorough review of literature on Indiana bat summer habitat, Rommé et al. (1995) concluded that areas with less than 5% deciduous forest coverage will not support summering Indiana bats. Localized areas considered as optimal habitat tend to have greater than 30% forest cover. Forest cover within some portions of the 3C corridor already may be too low or too fragmented (e.g., portions of Marion, Johnson, Daviess and Gibson counties) to support maternity colonies. Of the currently known Indiana bat maternity colonies in Indiana that are being actively monitored (apart from the I-69 colonies), only a few are persisting in areas with very low percentages of forest cover (e.g., <15%). In the cases where maternity colonies still inhabit areas with little forest, the remaining forest patches tend to be very well connected (A. King, pers. obs.).

In the Tier 1 BA Addendum, INDOT's consultant, BLA, conducted a detailed GIS data analysis to estimate the current amount of tree cover within a 2.5-mile radius circle centered on each of the 13 maternity colonies discovered during the summers of 2004 and 2005. **The current or baseline acreages (e.g., % tree cover) and conditions of the 13 maternity colonies are summarized in Table 7 of the BA Addendum and are hereby incorporated by reference.** Current total tree cover (5-meter resolution) within each maternity colony was variable and ranged from 1,319 acres (11% of the total area) for the West Fork-Elnora colony in Section 3 to 8,550 acres (68% of the total area) for the Plummer Creek colony in Section 4. Forest core area for each maternity colony ranged from 21 acres (2% of all trees) for the West Fork -Elnora colony to 2,928 acres (34% of all trees) for the Plummer Creek colony. The current number of total tree cover "patches" for each maternity colony area ranges from 53 patches in the Plummer Creek colony to 421 patches in the Pigeon Creek colony. Generally, a higher number of patches translate to more fragmentation and lower connectivity. Few large class patches, with no mid-size patches and then a scattering of very small patches suggests a high level of connectivity.

The majority of the forested tracts within the SAA are privately owned. Some unknown number of Indiana bats occupying private forests is likely to be adversely affected by non-protective timber harvest methods or other activities conducted in a manner that degrades or destroys the suitability of the habitat for Indiana bats. Conversely, we are aware of some State-owned lands and private lands that are being managed in a manner that is believed to be protective of Indiana bats. For example, the Indiana DNR's Division of Forestry manages the Morgan-Monroe and Martin State Forests, which both have parcels within the SAA. The state's Division of Forestry also manages the Ravinia Woods parcel, which was purchased by INDOT in partial fulfillment of meeting its I-69 forest mitigation commitment. The Division of Forestry is currently preparing a Habitat Conservation Plan for all the lands it manages in Indiana. Some level of incidental take of Indiana bats is anticipated on these lands during timber management activities; however, the Service believes that there ultimately will be a net benefit for the species. We assume bat-friendly habitat management also is occurring at the following areas (and will continue) within the SAA: Sugar Ridge Fish and Wildlife Area, Thousand-Acre Woods, Griffy Woods Nature Preserve, Bean Blossom Bottoms Nature Preserve, and Blue Bluff Nature Preserve. Similarly, we know bat-friendly forest management occurs at Crane and that all activities on the Patoka River National Wildlife Refuge are conducted in a manner that is protective of Indiana bats and many actions benefit the bats.

Ongoing Stressors in the SAA
The Service believes the following State, local, and private actions are currently occurring within the Action Areas and are likely to be adversely affecting some percentage of Indiana bats to variable degrees, and are likely to continue into the reasonably foreseeable future.

- Loss and degradation of roosting and foraging habitat – variable amounts of private and public, commercial and residential developments are converting, fragmenting, or otherwise degrading forest habitat available for roosting and foraging, especially near larger urban centers and along primary and heavily traveled secondary roadways and their main intersections. Most of the forest within the SAA is privately owned by numerous individuals and entities and some unknown proportion of this habitat may be managed in a manner that degrades the quality or completely eliminates the habitat.
- Commercial and private timber harvesting – Because some private timbering likely occurs on private lands within the SAA while bats are roosting in trees between 15 April and 15 September, some unknown number are exposed to this stressor and may be directly killed, harmed, or displaced as trees are felled in the summer.
- Cutting of Snags - While most primary and many alternate roost trees are dead snags that are ephemeral/short-lived, some small proportion are likely to be cut down before they would naturally fall in order to provide firewood, to improve aesthetics, or to reduce the risk of a dead tree from falling and hurting someone/thing (i.e., hazard tree).
- Degraded water quality – Point and non-point source pollution and contaminants from agricultural, commercial, and residential areas are likely present in waterways within the Action Areas and may reduce aquatic insect biomass that form a portion of the Indiana bat prey base and/or have direct or other indirect adverse effects on the bats themselves (e.g., females may have reduced reproduction in heavily contaminated areas).

Baseline for the Winter Action Area
Indiana bat spring-staging, fall-swarming and winter hibernacula habitat requirements are described in the **Life History** section of the biological opinion. Detailed information about each hibernaculum in the WAA is contained in the Tier 1 BA and Tier 1 BA Addendum and is hereby incorporated by reference. Indiana bats are dependent on suitable caves for hibernation during the winter and the forested habitat that surrounds them, which they use for foraging and roosting during the fall swarming and spring staging periods. The INDOT conducted intensive field surveys for Indiana bats at the numerous potential (i.e., previously undocumented) hibernacula (caves and tunnels) within 5-miles of the 3C corridor during the Tier 2 studies. The detailed results of these surveys are summarized in the Tier 1 BA Addendum and are hereby incorporated by reference. The primary findings are summarized below.

Of the 60 potential hibernacula surveyed during the winter of 2004/2005, a total of 32 Indiana bats were observed at three (3) different caves. One Indiana bat was observed at Cave, 28 at Cave, and three (3) at Cave. Cave and Cave are considered new hibernacula and were not originally included in those listed in the Tier 1 BA. Cave is considered part of the Cave System, which was one of the original hibernacula included in the Tier 1 BA. Of the 16 potential hibernacula surveyed in the winter of 2005/2006, one (1) Indiana bat was observed at So, is now considered a new hibernaculum as part of this study.

Of the 60 caves surveyed during the fall swarming period in the <u>autumn</u> of 2004, a total of 17 Indiana bats (3 female and 14 male) were captured at eight (8) different caves. Indiana bats were captured at Cave, Cave, Cave, Cave (Cave System), Cave, Cave, and Cave. Of the eight caves surveyed in the <u>spring</u> of 2005, no Indiana bats were captured. Of the 16 caves surveyed during the <u>autumn</u> of 2005, a total of four (4) Indiana bats (all male) were captured at two (2) caves. Indiana bats were captured at and Cave.

Hibernating Populations

Because Indiana bats form rather conspicuous clusters on cave ceilings while hibernating, bat biologists are able to obtain remarkably accurate estimates of winter populations within most hibernacula and thereby track population trends over time. The Service assigns each Indiana bat hibernaculum a "priority number" between 1 and 4 based on the number of bats that they shelter and their relative importance towards recovery. These priority numbers are defined below.

<u>Priority 1 (P1)</u>: Essential to recovery and long-term conservation of *M. sodalis*. Priority 1 hibernacula typically have (1) a current and/or historically observed winter population ≥ 10,000 Indiana bats and (2) currently have suitable and stable microclimates (e.g., they are not considered "ecological traps"). Priority 1 hibernacula are further divided into one of two subcategories, "A" or "B", depending on their recent population sizes. Priority 1A (P1A) hibernacula are those that have held at least 5,000 or more Indiana bats at some point during the last decade (e.g., must have had 5,000 or more hibernating bats since 1995). In contrast, Priority 1B (P1B) hibernacula are those that have sheltered ≥ 10,000 Indiana bats at some point in their past, but have not contained half that many (i.e., 0 – 4,999 bats) during surveys conducted over the last decade.

<u>Priority 2 (P2)</u>: Contributes to recovery and long-term conservation of *M. sodalis*. Priority 2 hibernacula have a current or observed historic population of 1,000 or greater but typically less than 10,000 and an appropriate microclimate.

<u>Priority 3 (P3)</u>: Lower contribution to recovery and long-term conservation of *M. sodalis*. Priority 3 hibernacula have current or observed historic populations of 50 - 1,000 bats.

<u>Priority 4 (P4)</u>: Least important to recovery and long-term conservation of *M. sodalis*. Priority 4 hibernacula typically have current or observed historic populations of less than 50 bats.

In 2003, only 10 Indiana bat hibernacula were known to occur within the WAA and were included in the original Tier 1 BO. As a result of the recent discovery of 3 new hibernacula during Tier 2 surveys and the discovery of another hibernaculum by the Service and the IKC, and with the inclusion of Cave, the total number of known Indiana bat hibernacula within the WAA now stands at 15. The 15 caves forming the basis of the WAA include nine (9) caves in western Monroe County - and caves, four (4) caves in eastern Greene County – and and two (2) caves in northwestern Lawrence County – and caves.. **<u>These 15 known Indiana bat hibernacula located within the WAA sheltered a combined total hibernating population of 74,042 Indiana bats in 2005/2006</u>** (Brack et al. 2005, Andy King per. comm.). Therefore, the 2005 WAA population represented approximately 36% of all the Indiana bats hibernating within the State of Indiana in 2005 (n = 206,610) and 16% of the range-wide population estimated to be 457, 374 bats in 2005 (U.S. Fish and Wildlife Service, unpublished data, 2006). **The Service considered the 2005 population data**

for each hibernaculum individually and collectively (74,042 bats) as the baseline for the Indiana bat population within the WAA. Population numbers and trends for individual caves within the WAA are available in Table 16 of the Tier 1 BA Addendum.

Two of the hibernacula within the WAA, (P1A) and (P1A) caves, which are located in close proximity to one another, have exhibited a dramatic increase in their hibernating populations of Indiana bats since detailed surveys have begun. In 1960, Cave only had 9 Indiana bats and Cave had 200, but nearly each survey year since then, these two caves have shown steady population increases. Surprisingly, between the 2001 and 2003 winter surveys, these two caves nearly doubled their winter populations with Cave going from 6,395 bats to 10,675, and Cave going from 5,419 bats to 10,338. In 2005, with a combined population of 19,145 bats, and caves sheltered 25.8 % of the Indiana bats that hibernated within the WAA in 2005. Most of the other hibernacula within the WAA have remained relatively stable or experienced population declines in recent survey years.

In the winter of 2005, Cave (P1A) held an estimated 54,325 Indiana bats making it the largest hibernating population in the WAA and the second largest hibernaculum in the entire range of the species. It was only surpassed by Cave (P1A) in Crawford County, Indiana, which held 54,913 bats in 2005. The 15 hibernacula within the WAA collectively held a total of 74,042 Indiana bats, which is approximately 16% of the known range-wide population. It is not known how much, if any, inter-cave movement occurs among hibernacula in the WAA between years, but movement between Cave and and has been recorded (Hall 1962) and exchanges between and are suspected.

Winter populations of Indiana bats in the State of Indiana declined from 1981 (148,000) to a low of 99,202 in 1985 before reaching a new recorded high of 206,610 bats in 2005 (USFWS, unpublished data, 2006. State-wide surveys of hibernacula in Indiana in 2005 revealed an increase of approximately 23,278 Indiana bats or a 13% increase over the 2003 population of 183,332 bats (Brack et al. 2003, USFWS, unpublished data, 2006).

Five of the 15 WAA hibernacula are located within the Garrison Chapel Valley (GCV), which is a well known karst area containing many large caves and springs in western Monroe County. and caves are the most important hibernacula in the GCV, both are Priority 1A hibernacula and are less than ½ mile apart (Dunlap 2001). In addition to its large Indiana bat population, Cave also has the highest population of little brown bats (*Myotis lucifugus*) of any cave in Indiana (n = 2363 little brown bats in 2003; Brack et al. 2003). The other three hibernacula in GCV, Cave, Cave System, and Cave, are Priority 3 hibernacula, but their current winter populations are all less than 200 Indiana bats. and caves seem to show similar trends with populations increasing in the 1990s and then showing quick declines in the late 1990s and 2000s. and show similar trends of sharp declines after the 1980s. Cave has shown little to no use in surveys since 1987. Most of the population declines in the Indiana bat hibernacula within the WAA are attributable to repeated human disturbances during the winter (Brack et al. 2003), but the sudden drop in Cave between 1987 and 1989 suggested a single significant disturbance (shotgun blast, entrance room campfire, etc) may have greatly reduced the hibernating population in this cave (Dunlap 2001).

Cave (P4) had a small population in the 1990s that declined to only 3 bats in 1999 and had 0 bats in 2005. Cave (P3) and Cave (P3) both seem to show trends of relatively stable populations, although Cave showed a dramatic decline in 2001 and a recovery in 2003 surveys (Brack et al. 2003). Cave (P4) was documented as a newly discovered hibernaculum containing 34 Indiana bats 2003 and 17 Indiana bats in 2005. Although the entrance to Cave is gated, the gate is not a bat-friendly design and may be lowering the cave's suitability as an Indiana bat hibernaculum. The gate's opening is much smaller than the original cave entrance and it appears to restrict the cave's potential air flow and may be causing flying bats to slow down while negotiating the gate and thus increasing their risk of predation by domestic cats and other animals (per. comm. with cave owner).

and caves are all recently discovered Priority 4 hibernacula that collectively only held 55 Indiana bat in 2005.

Available Swarming/Staging Habitat

INDOT's consultant, BLA, estimated the amount of tree cover within a 5-mile radius of 14 of the 15 (not calculated for which only had 1 bat) known Indiana bat hibernacula in the WAA and within the collective boundaries of these hibernacula, which comprise the overall WAA. These estimates were derived from aerial photos and provide a good indication of the quantity of foraging and roosting habitat that is currently available to bats during the swarming and staging periods. The estimates were presented in Table 18 of the Tier 1 BA Addendum and are hereby incorporated by reference. The total area within a single circle having a 5-mile radius is 50,240 acres or 78.5 square miles. The tree cover estimates around individual hibernacula ranged from a low of 25,763 acres around Cave to a high of 32,632 acres of tree cover around Cave. Therefore, percentages of forest ranged from 51% to 65% of the land within 5 miles of each cave. Collectively the revised WAA (including Cave) encompasses approximately 238,954 acres in western and southwestern Monroe, eastern Greene, southeastern Owen, northwestern Lawrence, and northeastern Martin counties (Figure 4) of which approximately 60% (143,948 acres) is forest.

A separate analysis of swarming habitat surrounding each of the10 caves where small numbers of Indiana bats were captured during the falls of 2004 and 2005 was not deemed warranted and therefore was not conducted. If a 5-mile buffer had been placed around these caves, the majority of the area would already be contained within the currently delineated WAA and therefore are mostly captured in calculations for the total WAA.

The vast majority of forested tracts within the WAA is privately owned and may be vulnerable to timber extraction or other activities that may degrade or destroy the suitability of the habitat for Indiana bats. At this time, we are aware of two large forested parcels totaling 543 acres that are providing high-quality swarming habitat to the bats hibernating in the caves in the Garrison Chapel Valley in Monroe County and will remain forested in perpetuity. One parcel is enrolled in the Federal Forest Legacy program and the other has been voluntarily placed under a conservation easement held by the Sycamore Land Trust. Purchase of a third forested parcel containing and caves is actively being pursued at this time by the Indiana DNR with the aid of Federal and state funds.

A minimum threshold or optimum amount of surrounding swarming/staging habitat has yet to be defined for Indiana bats. However, we assume that Indiana bats are more likely to have their foraging and roosting needs met if their hibernacula are immediately (the closer the better) surrounded by large, relatively undisturbed contiguous tracts of mature and overmature forest as opposed to being surrounded by only small, highly fragmented woodlots, interspersed with agricultural, commercial, and residential areas. Additional habitat parameters that may be more indicative of the swarming/staging habitat's quality and degree of connectivity were included in the BA Addendum.

Ongoing Stressors in the WAA

The Service believes the following State, local, and private actions are currently occurring within the WAA and are likely to be adversely affecting some unknown percentage of Indiana bats to variable degrees, and are likely to continue into the reasonably foreseeable future.

- <u>Repeated human disturbance of hibernating bats</u> – primarily caused by local and regional, organized recreational cavers, spelunkers, and vandals. Fourteen of the 15 hibernacula in the WAA are privately owned caves, only Cave is on state-owned land. and caves are being specifically managed to protect hibernating Indiana bats via a private lease held by the Indiana Karst Conservancy. Only three of the 15 caves are currently gated or fenced to prevent unauthorized human visitation.
- <u>Loss and degradation of swarming/staging habitat</u> – commercial and residential development are slowly encroaching upon many of the hibernacula, especially those close to the west side of Bloomington and are reducing the overall amount of forest cover available for roosting and foraging. Fortunately, hibernacula and surrounding forests in Monroe County receive some level of protection under the county's current zoning ordinances and the required timber harvest permits required by the Monroe County Planning Department. There is no zoning or oversight of timber harvests in Greene or Lawrence counties. Because, the vast majority of the remaining forest within the WAA is privately owned by numerous individuals and entities, some proportion of the forest land may be vulnerable to activities that could temporarily or permanently degrade or destroy the suitability of the habitat for Indiana bats.
- <u>Degraded water quality</u> – Some private residential developments with faulty septic systems are likely to be introducing untreated residential sewage into underground streams that may flow through some of the hibernacula and eventually resurface at springs, reducing aquatic insects and a portion of the Indiana bat prey base.
- <u>Commercial and private timber harvesting</u> –Because some unquantified number of large and small timber harvests occur within 5-miles of hibernacula while bats are roosting in trees between 1 April and 15 November some unknown number may be directly taken as the roost trees are felled.

<u>Bald Eagles in the Action Area</u> (not revised since Original BO)

No previous section 7 formal consultations involving bald eagles have been conducted within the boundaries of the Bald Eagle Action Area established for Alternative 3C of I-69, however, the Service has conducted informal consultations in similar eagle habitat elsewhere in the state. Bald eagle habitat requirements are described in the **Life History** section of the biological opinion.

Most of the bald eagles nesting within Indiana today are the result of a successful eagle restoration project conducted from 1985 to 1989 by the Indiana DNR's Nongame and Endangered Wildlife Program. Over this five-year period, 73 bald eagle chicks were hacked and released at Monroe Reservoir in Monroe County. When the released eagles reached adulthood at four to five years of age, many returned to nest within 50-100 miles of where they had fledged. Most nests are located in south central Indiana and are found on larger reservoirs and along the Wabash and White River. Indiana's first successful bald eagle nest in this century was in 1991 at Lake Monroe. The state's last successful nest before then was in 1897. By that time Indiana had lost most of its once extensive wetland habitat and in the 1950's and 60's eagle populations decreased further as they failed to reproduce due to egg shell thinning caused by pesticides, such as DDT. As of March 2003, there were 37 reported bald eagle nests within the southwestern portion of the Indiana. Some of these nests may serve as winter use sites too. Twenty-three of the 37 nest sites were also used by eagles in 2002.

Midwinter bald eagle surveys conducted since 1979 have shown a dramatic increase in wintering eagles in the state. During the Midwinter Eagle Survey in January 2003, 145 bald eagles were counted, 29% below the count for 2002 and 48% fewer than the record of 280 in 2001. However, this is only 5% below the average of the past 10 years. The low number counted in 2003 is attributed to a lack of sustained cold weather prior to the survey, resulting in fewer numbers of eagles moving south (Castrale and Holbrook 2003). Bald eagle research in Indiana by the IDNR Non-game Wildlife Program is ongoing and includes winter surveys by helicopter, monitoring of bald eagle nests, and banding of young bald eagles.

Nesting and Wintering Areas within or near the Action Area
No known nests are currently located within the Bald Eagle Action Area. However, nests in two areas are less than a mile of the Action Area boundary.

1. The first nest is located on the West Fork of the White River near Waverly in Morgan County. This nest was first reported in 2002. If standard disturbance management zones are implemented around this nest (USFWS 1983a), the tertiary zone would likely overlap a portion of the Action Area's outer limit, which follows S.R. 37 in this project section.
2. The second nesting area is located near the South Fork of the Patoka River, east of the proposed I-69 bridge crossing in Gibson County. Two bald eagle nests are located in this area and were first reported in 2001 and again in 2002, and 2003. The two nests are less than 1,500 feet from one another, and are assumed to be within the breeding area of a single pair of eagles. Both nests are on Federal land managed by the Service's Patoka River National Wildlife Refuge staff. The proposed 3C corridor is just over 1 mile from the tertiary zone boundaries of both nests or just outside of the Bald Eagle Action Area.

Although bald eagles could potentially nest in different forest, wetland or riparian areas within the Action Area, the most likely nesting areas are near the proposed crossings of the Patoka River and the East Fork of the White River and in the areas where 3C Corridor closely approaches the West Fork of the White River (project sections 2, 5, and 6; Figures 2 and 3). Likewise, most of the wintering bald eagles should be concentrated in these same areas.

No bald eagles nested near the proposed I-69 crossing of the East Fork of the White River in 2003. In 2002, the nearest reported nest on the East Fork was about 8 miles upstream from the proposed crossing. Also, there was a reported nest just over 10 miles west of the proposed crossing on the mainstem of the White River, downstream from the proposed I-69 crossing.

Ongoing Threats
The Service believes the following State, local, and private actions are likely to be occurring to some bald eagles or their habitat within or near the Bald Eagle Action Area, and that these activities may be adversely affecting them to some degree and are likely to continue into the reasonably foreseeable future.

- Disturbance of eagles while nesting, foraging, and perching/roosting – eagles are often disturbed visually and/or by load noises from various sources such as motorized watercrafts, all-terrain vehicles, road traffic, farm machinery, chainsaws, and gunshots.
- Degradation of water quality/prey base - Point and non-point source pollution from things such as agricultural pesticides, soil erosion, road salt, livestock waste, and commercial, industrial, and residential wastes all reduce aquatic diversity and abundance including fish that form a large portion of the bald eagle's prey base.
- Loss of bottomland and riparian forest habitat –As a result of expanded agricultural, industrial, commercial, and residential developments and timber harvests within the floodplains of large rivers.

IV. EFFECTS OF THE ACTION

While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

- proximity of the action to known species locations and designated critical habitat,
- distribution of the disturbances and impacts (in this case a linear corridor),
- timing of the effects in relation to sensitive periods in the species' lifecycle,
- nature of the effects – how the effects of the action may be manifested in elements of a species' lifecycle, population size or variability, or distribution, and how individual animals may be affected,
- duration of effects - short-term, long-term, permanent,
- disturbance frequency - number of events per unit of time, and
- disturbance severity - how long would it take a population to recover?

INDIANA BAT

The original discussion of the direct and indirect effects of I-69 from the original BO has been moved from this location and placed in **Appendix A**. This discussion is still valid, but was placed in an appendix to improve clarity and flow of the revised BO.

New Effects Analysis
Because much more detailed information and data are now available for analysis, we were able to conduct a much more thorough and rigorous effects analysis for the Indiana bat for this revision to the BO. For this revision, we deconstructed I-69 into its various project elements and determined the direct and indirect environmental consequences that Indiana bats would be exposed to. We conducted various exposure analyses for each project activity that may directly or indirectly affect

the bats and outlined the likely responses of the bats and their local populations to each of these potential stressors. Our primary focus was placed on the 13 maternity colonies in the SAA and the 15 hibernacula in the WAA. We determined which of the project-related stressors was likely to result in take of Indiana bats and conducted a detailed incidental take analysis for bats in both the SAA and WAA. The results of our effects and incidental take analyses are summarized in a series of five tables (Tables B1-B5) presented in **Appendix B**. Please review each of these tables for further information. Only key findings of these effects analyses are discussed in greater detail below.

Stressors

The primary, project-related stressors that we determined Indiana bats were likely to be directly or indirectly exposed to that were also likely to cause some level of incidental "take" included:

- I-69 Direct Impacts/Loss of Roosting Habitat
(seasonal cutting restrictions observed so no direct killing anticipated),
- I-69 Direct Impact/Loss of Foraging Habitat/Connectivity,
- Construction Noise/Vibrations causing bats to stress and flee roosts, with increased risk of predation (while bats are present in adjacent areas),
- Disturbance & Habitat Loss associated w/ Demolition and Relocation of 390 Homes & 76 Businesses (no timing restrictions),
- Habitat loss from I-69 related Utility Relocations (no timing restrictions/bats may be present),
- Additional High-speed traffic in Action Area leading to Roadkill,
- I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)
- Increased Levels of Disturbance/Vandalism of Bats in Vulnerable Hibernacula

Other potential project-related stressors that bats may be exposed to, but are not anticipated to cause incidental take because of their insignificant or discountable effects are listed in Table B1 in Appendix B.

Responses of Exposed Bats to Stressors

With an understanding of how, when, and where Indiana bats will be exposed to the proposed action, we then determined whether and in what manner these individuals are likely to respond after being exposed to the proposed action's effects on the environment or directly on the Indiana bats themselves. To accomplish this, we asked "How will Indiana bats likely respond after being exposed to the effects of the proposed?" Our analysis entailed identifying the range of possible responses Indiana bats could exhibit as a result of being exposed to the project-related stressors (see Table B1 in Appendix B). To ensure a thorough analysis of effects, the range of probable responses, not just the most deleterious, for each exposure pathway were identified. As is true in humans, bats typically demonstrate some degree of individual variability as seen by their range of responses to various stimuli. Therefore, accurately predicting how a generic, individual Indiana bat may or may not respond to a stressor is an inherently difficult task with little scientific literature available for guidance. Nevertheless, relying heavily on our personal knowledge of the species and general biological principles and logic, we identified the following range of responses of individuals and their local populations during or after exposure to project-related stressors:

0. no response
1. startled: increased respiration/heart rate
2. **death/injury of adults and/or offspring**
3. **flees from roost during daylight / ↑predation risk**
4. abandons roost site(s)
5. abandons foraging areas
6. shifts focal roosting and/or foraging areas
7. **↑ energy expenditures / ↓ fitness (short-term)**
8. ↓ energy expenditures / ↑ fitness (long-term)
9. **aborted pregnancy/repro. Failure**
10. **↑torpor, delayed development/partuition, and/or delayed sexual maturation of offspring**
11. **short-term ↓ colony reproductive rate (3-4 seasons)**
12. **short-term ↓ in colony/hibernaculum size (3-4 seasons)**
13. long-term ↑ colony reproductive rate
14. long-term ↑ in colony/hibernaculum size/fitness level
15. **long-term ↓ in colony/hibernaculum size/fitness level**

Response numbers 2, 3, 7, 9, and 10 are in bold because we anticipated that these negative responses are likely to rise to the level of take (as defined in the ESA) of one or more exposed Indiana bats in the action area. Similarly, Responses 11, 12, and 15 are the negative responses to local populations that would result from take of individual bats.

Please see Table B1 in Appendix B, which identifies the specific behavioral and physiological responses of individuals and the demographic responses of local maternity colonies/hibernating populations that we anticipate will occur for each of the project-related activities.

Analysis of Stressors Causing Take of Individual Bats

Loss of Roosting and Foraging Habitat - Because potential roost trees within the I-69 footprint will be cleared while bats are absent (between 15 September and 15 April), we do not anticipate any direct mortality from the felling of these trees. However, a few individual females from each of the 13 maternity colonies may be taken once they return to their traditional roosting areas the following season and find that their primary or alternate roost tree is gone. Given the locations of the known roost trees, we have generally assumed that no primary maternity roost trees (i.e., roost trees used by ≥ 30 adult females and or their offspring on multiple occasions) are likely to be directly felled during the construction phase of I-69 (Table B3, Appendix B). However, we do believe it is reasonable to assume that between one to ten occupied alternate roost trees typically containing far less than 30 bats may be felled and lead to the death or injury of some proportion (but not all) of the bats as a result of I-69 induced growth and/ or the relocation of those people displaced by the interstate.

Because the footprint of this transportation project is primarily linear in shape, losses to any one patch or areas of important habitat (e.g., maternity colony area or hibernacula swarming areas) are automatically minimized. For most maternity colonies and hibernacula areas it appears that I-69 would not directly or indirectly eliminate a significant amount of the existing forest cover nor would it create a permanent barrier to movement among forest patches. (see Table B2 in Appendix B).

Because maternity colonies and individual male Indiana bats commonly shift their use among multiple roost trees it is assumed that some unoccupied roost trees will be felled as well. In this case no direct adverse effects or take will occur, but some indirect adverse affects could still stress some Indiana bats to the point where take is reasonably certain to occur. For example, it is possible that the majority of the alternate roosts trees being used by one or more of the13 maternity colonies are located within or near some of the proposed interchange areas and as a result a large proportion of such a colony's alternate roosts (assuming primaries will remain standing) may be felled. Loss of multiple alternate roost trees would cause displaced individuals to expend increased levels of energy while seeking out replacement roost trees. If this increased expenditure occurred during a sensitive period of a bat's reproductive cycle (e.g., pregnancy) it is assumed that spontaneous abortion or other stress-related reproductive delays or losses would be a likely response in some individuals, particularly those that may have already been under other environmental stresses or perhaps stressed by other project-related stressors (e.g., increased noise levels). It has been hypothesized that these stresses and delays in reproduction could also cause lower fat reserves and ultimately lead to lower winter survival rates (USFWS 2002). For example, females that do give live birth may have pups with lower birth weights or their pups may have delayed development (i.e., late into the summer). This could in turn affect the overwinter survival of the young-of-the-year bats if they enter fall migration and winter hibernation periods with inadequate fat reserves.

Noise, Tree Felling, and Predation Risk – Most noise generated from project-related construction activities will likely occur during daylight hours when Indiana bats are roosting in trees. Unfamiliar noises from the operation of chainsaws, bulldozers, skidders, trucks, etc. are likely to occur in relatively close proximity to occupied primary and alternate roost trees during the summer reproductive season. The novelty of these noises and their relative volume levels will likely dictate the range of responses from individuals or colonies of bats. At low noise levels (or farther distances), bats initially may be startled and have increased respiration/heart rates, but they would likely habituate to the low background noise levels. At closer range and louder noise levels (particularly if accompanied by physical vibrations from heavy machinery and the crashing of falling trees) many bats would probably be startled to the point of fleeing from their day-time roosts and in a few cases may experience increased predation risk. Because the noise levels in construction areas will likely continue for more than a single day the bats roosting within or close to these areas are likely to shift their focal roosting areas further away or may temporarily abandon these roosting areas completely. Callahan (1993) noted that the likely cause of the bats in his study area abandoning a primary roost tree was disturbance from a bulldozer clearing brush adjacent to the tree. Female bats in Illinois used roosts at least 1640 ft (500 m) from paved roadways (Garner and Gardener 1992). Very low bat usage close to Interstates has also been noted by other bat biologists (Whitaker, Jr. per. comm.). Conversely, some bats did use roosts near the I-70/Indianpolis Airport area, including a primary maternity roost 1,970 ft (0.6 km) south of I-70. This primary maternity roost was not abandoned despite constant noise from the Interstate and airport runways, however; their proximity to the Interstate could also have been due to lack of more suitable roosting areas and furthermore the noise levels from the airport were not novel to the bats, so they had apparently habituated to them (USFWS 2002).

We also assume that some bats that would be startled by the noise and vibrations coming from a chainsaw would successfully exit their roost trees prior to the tree being felled. Bats that remained in a roost tree and survived the initial felling would likely try to crawl and fly away from the immediate area, but being unaccustomed to flying during the daytime and likely injured or disoriented from the fall, would likely have a relatively high risk of predation from diurnal predators. Bats that successfully flee the disturbance uninjured would not be expected to return to that area and would likely shift their focal roosting (and perhaps foraging) area at least temporarily. We assume that any surviving young that were still nursing and non-volant (i.e. to young to fly) would soon die if their lactating mothers were directly or indirectly killed by a felled roost tree during the middle of the maternity season.

Roadkill - We anticipate that bat-auto collisions (i.e., roadkill) on the proposed interstate would be the single largest cause of take to Indiana bats (both male and female) within the Summer Action Area (n=126 bats over 17 years) and the second leading cause of take in the Winter Action Area (See Tables B4 and B5 in Appendix B). However, because we anticipate that the total amount of take will be evenly spread over a projected 17-year period of time, we anticipate that the annual amount of take for any given maternity colony or hibernating population will be insignificant. For example, we have conservatively estimated the risk of roadkill for each colony of 160 bats has a 0.05% chance of take over the course of 17 years, which is equivalent to 8 bats per colony. Likewise, this amount of roadkill is insignificant at the regional or species level.

Increased Risk of Disturbance/Vandalism of Bats in Vulnerable Hibernacula - Because I-69 is anticipated to induce indirect development and thereby increase the human population within the WAA and will provide improved, convenient accessibility to people that live outside the WAA (e.g., via the proposed Greene/Monroe countyline interchange), we believe it is reasonable to assume that a small proportion of these "new" people will want to explore the caves in the area and will thereby increase the inherent risk of disturbing hibernating Indiana bats within caves that are currently unprotected (i.e., ungated and/or unfenced). Therefore, we have estimated that this increased risk is equivalent to a taking of 1% of the 2005 winter population of each unprotected hibernaculum within the WAA at some point(s) after I-69 becomes operational through the year 2030 (see Appendix B, Table B5). This scenario also assumes that the owners of vulnerable hibernacula will not allow their cave(s) to be gated (this is a reasonable assumption in itself given previous failed attempts at at least one important cave). In a reasonable worst-case scenario an unauthorized visitor(s) or vandal(s) would enter a hibernaculum and directly or indirectly kill/take (e.g., direct, physical contact with bats is not required for arousal to occur and essential fat reserves to be depleted and subsequently leading to starvation) hundreds of Indiana bats. While this scenario could still occur with or without I-69, we believe that it is more likely to happen with the proposed interstate and interchanges in place (i.e., overall improved accessibility). However, the Service believes it is extremely unlikely (i.e., discountable) that I-69 would cause an increased risk of someone physically altering or vandalizing unprotected caves to the degree that they would no longer remain suitable habitat. Typically, the worst physical alterations to the caves themselves are likely to be an increased prevalence of spray-painted graffiti and trash.

Insignificant and/or Discountable Stressors to Individual Bats

Short-term Water Quality Impacts - Water quality affects the Indiana bat in the Action Areas in terms of its aquatic insect prey and drinking water sources. In general, the streams in the Action Areas exhibit a wide variety of aquatic habitat types and associated species. The project area has many ephemeral and perennial streams with narrow riparian areas that will be crossed by I-69. There is some potential for sediment to move down the ephemeral channels into intermittent and perennial streams after rainfall events. Removal of vegetation during or after grading activities could potentially cause short-term adverse effects on the hydrologic characteristics and water quality in a watershed. A reduction in vegetative cover could potentially increase water yield and stream discharge; changes in vegetation cover could alter normal nutrient cycles in both terrestrial and aquatic systems, and use of temporary access/construction roads and trails during the construction phase could cause soil erosion leading to sedimentation. Potential effects from removal of vegetation and soil disturbance would be temporary. Proposed soil erosion and sediment control measures such as riparian vegetative buffer strips, equipment limitation zones, contouring for drainage control, outsloping roads, and providing waterbars, mulching, and seeding would be implemented and greatly reduce water quality degradation. Finally, some small potential exists for accidental fuel/oil spills or spills of other hazardous materials from chainsaws and heavy equipment during the pre-grading forest clearing phase and related roadwork, which could degrade the quality of both surface and ground water, but given the degree of project oversight, we believe the odds of a large spill occurring and entering a waterway are discountable. Although, water quality could also be adversely affected during a major spill or accident once I-69 is operational, the probability of this not known. These types of impacts will be considered further in Tier 2.

Risks to Local Bat Populations

Maternity Colonies – Bat surveys and radio-tracking studies have documented the presence of 13 maternity colonies, which we are assuming are comprised of 80 adult females and their 80 young (13 colonies x 160/colony = 2080 reproductive female and juvenile bats) in the SAA. We estimated that during the first 20+ years of the I-69 project that a maximum combined total of 281 adult female and juvenile Indiana bats may be taken directly or indirectly taken by project-related activities (see Table B4 in Appendix B). For perspective, even if all of this take were to occur within a single reproductive season (again this is not anticipated), it would only cause a relatively small decline in the estimated annual local breeding population (281/2080 bats = 13.5% loss) within the Summer Action Area. We anticipate that take of these individuals would likely be spread among many of the 13 maternity colonies, not just a few. However, in a worst-case scenario, where all 281 estimated bats were taken from just 6 of the 13 existing colonies, this would still only represent a 30% reduction in each of these colony's memberships. Under no likely scenarios, is the estimated amount of loss/take of reproductive individuals likely to cause an appreciable long-term change in viability of an individual maternity colony let alone to the species' regional or range-wide status. At worst, only short-term (2 or 3 maternity seasons) reproductive loss and reduction in numbers of 13 local maternity colonies is anticipated as a result of the Proposed Action. In none of the maternity areas is the amount of proposed tree clearing or anticipated induced development believed to be extensive enough to cause a maternity colony to be permanently displaced from its traditional summer range. If however, our suppositions are wrong and these maternity colonies are displaced, there is currently additional suitable habitat available in adjacent areas that they could relocate to with minimal effort (personal observations based upon aerial photo interpretations).

Please refer to Tables B2 – B4 for a comparison of anticipated impacts among the 13 maternity colonies. As indicated in Table B3, **despite the direct and indirect impacts from I-69 and other cumulative impacts, the Service believes that all 13 of the maternity colonies should still be able to persist in their current maternity areas (MA), especially if proposed mitigation efforts are successful.** In fact, the Service only has a high level of concern for four out of the 13 colonies in regards to their long-term (50+ years) conservation/sustainability. Based upon our analysis, the colonies that are at greatest long-term risk of becoming non-viable are Pigeon Creek, Veale Creek, West Fork – Crooked Creek, and West Fork – Pleasant Run. We will be taking an especially close look at these colonies during our review of Tier 2 BAs and their mitigation plans to further ensure their conservation.

Pigeon Creek Colony – This colony has a low percentage of existing tree cover (15%) and has the highest acreage of habitat threatened by cumulative effects from development and potential dredging of legal drains. The cumulative impacts (279-acre reduction in tree cover by 2030) are likely the largest threat to this colony at its present location. This colony is located near the intersection of I-64 and I-69 and has a proposed interchange within the maternity area, which will likely hasten further development. No roost trees were found for this colony in Tier 2 field studies. Lots of habitat along Pigeon Creek remains to the east of this MA. We are not aware of any permanently protected forest habitat in this area.

Veale Creek Colony – The 2.5-mile area surrounding this colony currently has low tree cover (15%) and the I-69 representative alignment runs very close to the colony's primary roosting area. This colony is also near the City of Washington and the proposed interchange of I-69 and U.S. 50.

West Fork – Crooked Creek Colony – This colony is located in an area with moderate tree cover (30%) that is highly fragmented and poorly connected. Because this colony is within an easy commuting distance of Indianapolis, cumulative impacts from residential development are very likely here. A new, large golf-course community is currently planned within this area.

West Fork – Pleasant Run Colony – This colony is in a very rapidly developing area along S.R. 37 south of Indianapolis. Although it currently has 19% tree cover, it will likely be threatened by high cumulative impacts in the foreseeable future.

In summary, the following effects are anticipated for the 13 maternity colonies within the SAA:

- Habitat loss will be minimal for all colonies: 10 colonies will lose less than 1% of their tree cover, and the other three will lose 1.4%, 1.5% and 2.9%. So, the total amount of forest loss is relatively insignificant for each colony. It is also unlikely that any maternity area would experience a significant long-term decrease in quality of roosting or foraging habitat as a direct result of I-69 (this will be investigated further in Tier 2).
- Seasonal tree-cutting restrictions will ensure no direct impacts/take occurs from this activity during the maternity colony season.
- Primary roost trees are not likely to be destroyed in 9 of the 13 maternity colonies (Appendix B, Table B3); primary roosts trees were not located for the other 4 colonies, so it is uncertain whether they would be adversely impacted during the winter clearing season.
- All maternity colonies have additional habitat that is available nearby if some bats should become displaced.

- Forest mitigation within each maternity area will insure suitable roosting and foraging habitat persists in these areas in perpetuity.

Although there may be some short-term impacts to individuals, these impacts are not likely to affect a colony's long-term reproduction and survival. Thus, all 13 Indiana bat maternity colonies are likely to persist within the SAA following the I-69 project.

Local Populations of Males– Because adult males (and presumably many non-reproductive females) do not participate in the rearing of offspring, they typically lead solitary lives or in some cases small bachelor colonies during the summer. Because these individuals are not burdened with a dependent young they presumably would be more apt to flee from their roost trees than reproductive females would be when faced with a disturbance. Therefore, it is very unlikely that the felling of an occupied roost tree would ever have more than a few adult males in it at any one time and even more unlikely for take of more than one male to occur per event. We estimated a maximum total of 56 adult males may be taken as a result of the Proposed Action. The potential loss of this relatively small number of male bats will have no measureable or significant impact on the non-breeding Indiana bat population in the Action Areas or beyond.

Hibernating/Swarming Populations – No direct adverse impacts are anticipated to any of the 15 physical cave structures in the WAA that are known to serve as Indiana bat hibernacula. The only hibernaculum that appears to have hydrological connectivity (i.e., groundwater connections) with the proposed I-69 corridor is Cave. This cave is not currently, nor has it been in the past, an important hibernaculum for Indiana bats (i.e., it is a Priority 4 hibernaculum). Cave is prone to flooding and contained no hibernating Indiana bats when it was last surveyed in January 2005 (Brack et al. 2005). The bulk of anticipated take to bats residing in the WAA are likely to be caused by unauthorized, human disturbances of hibernating bats in vulnerable hibernacula and roadkill of foraging bats (would primarily occur during the annual swarming period in late summer and fall). Under the reasonable worst scenarios, the anticipated levels of take for these two threats are not likely to significantly impact the regional populations and would not be expected to jeopardize the species. For example, we estimated that up to 857 Indiana bats may be taken in the WAA over a 17-year period ending in 2030. Even in the extremely unlikely event that all 857 bats died in a single year, this would only amount to a loss of 1% of the WAA's most recent winter population of 74,042 bats. Nevertheless, there is a high degree of uncertainty associated with our estimated amount of take from unauthorized human disturbances/vandalism at vulnerable (i.e., ungated) hibernacula. Therefore, should our assumption of a relatively low level (1% increase) of I-69 induced take prove to be in error for this particular stressor, there could be dire consequences to the species' long-term conservation and recovery. If available, additional information (e.g., current and past levels of unauthorized winter visitation at local hibernacula) will be evaluated in relation to this stressor in Tier 2.

Over 99% of the 74,042 bats that hibernate in the WAA spend the winter in just 3 of the 15 known hibernacula: (73.3%), (12.5%) and (13.3%) caves (i.e., the bat populations in the other 12 hibernacula in the WAA are relatively insignificant). Because, the footprint of I-69 is over 5 miles away from Cave and is 3.9 and 4.5 miles away from and caves (respectively), there will be no direct impacts to these important hibernacula. Similarly, direct and/or indirect impacts to the forested habitat surrounding these hibernacula is <1% of what exists currently.

The "Winter Action Area Hibernacula Analysis" chapter and Appendix B of the Tier 1 BA Addendum should be consulted for more detailed information regarding anticipated impact levels for each hibernaculum and the WAA as a whole. Also, see Table B5 in Appendix B for a summary of anticipated levels of incidental take among the hibernacula in the WAA.

Effects on Habitat Quality

In addition to direct habitat loss, proposed actions may result in a decrease in the quality of remaining habitat within the Action Areas. Factors that may lead to a loss in the quality of remaining habitat include: increased habitat fragmentation; increased human disturbance (e.g., more lighting associated with road improvements, increased traffic and associated noise); foraging habitat over culverted or relocated streams will be poor until the aquatic community becomes established; and water quality in the Action Areas may be negatively impacted, at least in the short term during construction activities, and potentially in the long-term from road salts, and various hazardous materials leaked during traffic accidents. Over time, it is expected that fragmentation of habitat in the Summer and Winter Action Areas will increase as new indirect development occurs. However, as the mitigation plantings mature into suitable Indiana bat habitat this may be partially compensated. The majority of fragmentation to core forests will occur in the large forested tracts of land in Greene and Monroe counties.

Given the nature of the landscape in some portions of the SAA, there would be little potential for existing colonies to relocate if the quality or quantity of habitat in the area could no longer support the colony. The continued survival of a colony in this situation would likely be dependent on maintaining suitable habitat within the action area of the project as is being proposed with the forest mitigation plans.

Increased human disturbance in the project area may affect the quality of summer bat habitat, but these effects are expected to be relatively minor. However, human disturbance within an unprotected Indiana bat hibernaculum could be severe. Some Indiana bats in the Action Areas that have not previously been exposed to artificial lighting, high noise levels and highway traffic may avoid habitat near I-69, but this will probably only be a relatively minor adverse affect of the project.

Insects associated with aquatic habitats make up part of the diet of Indiana bats; therefore, water quality can affect the prey base of the species. Water quality impacts that may result from the proposed project include the relocation of stream channels, increased sedimentation as the result of construction activities, and increased runoff (and associated pollutants) from newly constructed roadways. All currently wooded s stream channels that must be relocated will be planted with hardwood seedlings (legal drains may be an exception), which are expected to stabilize the banks; eventually trees are expected to provide shade to the riparian corridor, a source of woody debris to provide in-stream habitat, and Indiana bat foraging cover. Until these newly relocated channels become established, they will not provide good foraging habitat for Indiana bats. Consultation with the FHWA and INDOT will be ongoing to insure that relocated stream channels produce viable aquatic systems. Aquatic communities will be monitored post-construction and remedial actions will be required if established criteria are not met. Erosion control plans will be implemented during all construction activities. Properly implemented erosion control measures should alleviate short-term sedimentation impacts on the aquatic insect community. We do not have information that suggests that these water quality impacts will result in a long-term decline in the prey base available to Indiana bats in the project area. However, a short-term decline in insect production is possible, and may exacerbate the issue of lost foraging habitat in the project area.

Effects of Avoidance, Minimization and Mitigation Measures

The FHWA and INDOT have incorporated measures into the proposed project design to avoid, minimize and mitigate the impacts of the project to the extent practical. Proposed avoidance, minimization and mitigation procedures are discussed in the **Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan** (see Appendix D of the Tier 1 BA Addendum) and the **Conservation Measures** section in this document.

To minimize impacts to bats due to habitat loss, existing forested habitat suitable for Indiana bat foraging, roosting, swarming, hibernating, and staging within the Summer and Winter Action Areas will be identified, and offers to purchase these areas will be made to the land owners, and bought when sellers are willing, and then they will be protected in perpetuity for the primary purpose of Indiana bat conservation. Silvicultural manipulation in these areas will be limited to activities which will enhance the quality of habitat for Indiana bats, as agreed on by the Service's BFO. Areas targeted for permanent protection will generally be of equal or higher quality (i.e., more mature trees) than many of areas that will be cleared for I-69. In addition, areas will specifically be sought that would provide larger forest blocks, and that would protect areas providing connectivity among existing blocks of forested habitat and other areas identified in Tier 2 studies as providing valuable habitat for Indiana bats or serving as travel corridors.

The FHWA and INDOT are proposing to mitigate for the permanent and unavoidable loss of forests (3:1 ratio) and wetlands (ratios in Table 2) within the action areas by purchasing existing habitat, and/or creating, restoring, and enhancing habitat. Based on revised Tier 1 estimates of impacts, the committed mitigation acreage would be up to approximately 6,585 acres. In Tier 2, this number will likely change (probably will be smaller as impacts are anticipated to be smaller). The actual mitigation acres will be determined based on impact acres and the committed ratios which could provide higher or lower mitigation acres than the amounts estimated in the Biological Assessment Addendum. Some mitigation areas will be planted with a mixture of native hardwood seedlings and protected in perpetuity. The goal of the plantings will be to enhance Indiana bat habitat in the long term by providing forested habitat, improving connectivity among blocks of existing habitat, and creating larger blocks of forested bat habitat. The specific sites proposed for plantings will also be located to improve the connectivity of forested habitat within the range of maternity colonies that would be adversely affected by I-69. Improved connectivity of habitat between roosting and foraging areas is expected to improve habitat conditions for Indiana bats. Permanently protected plantings along stream corridors will also benefit water quality in the long term, as the plantings will provide a vegetated buffer that will reduce runoff, and associated sedimentation, from adjoining roadways, commercial/industrial developments, and agricultural areas. In the long term, mitigation plantings will provide a diverse woodland that is well stocked with species of trees that are known to provide Indiana bat roosting habitat. Plantings will be monitored to insure that at least 80% of the initial planting survives; if survival is below 80% five years after planting, then remedial measures will be taken. There will be no manipulation of vegetation (e.g., mowing, timber harvest, timber stand improvement, firewood collecting) in these mitigation areas without consultation with the Service's BFO.

An extensive monitoring and research program is also proposed by the FHWA and INDOT. Therefore, the 13 Indiana bat colonies discovered in the action area during Tier 2 field studies would be studied and monitored the summer prior to and at least 5 summers post-construction, beginning with the first summer following the start of construction. The details of the proposed monitoring plan will be developed in consultation with the Service and finalized during Tier 2 formal consultations for each affected project section.

As previously noted, a colony of Indiana bats in the vicinity of the Indianapolis International Airport has been studied since 1994; this is the longest that any single colony of Indiana bats has ever been studied. The baseline data that are currently available on this colony, in conjunction with the data that is being collected through a 15-year monitoring program, will allow the Service to thoroughly evaluate the response of an Indiana bat colony to habitat disturbance from a major construction activity as well as the effectiveness of the mitigation measures implemented there. The Service intends to use information gained from the airport colony to help guide mitigation and monitoring efforts for any Indiana bat colonies found within the SAA of I-69.

The FHWA and INDOT will also work with the Service's BFO to design an educational poster and interpretive displays about Indiana bats to be placed in rest stops along I-69. The Indiana bat recovery plan (USFWS 1983b) identifies public education on Indiana bats as a priority activity needed for recovery of the species.

Bald Eagle (not revised since Original BO)

Direct Impacts

CONSTRUCTION

- Tree Removal

    - Loss of forest habitat will occur within the Bald Eagle Action Area and may adversely affect some eagles. Although, all of the forest would not be preferred bald eagle habitat, some may be. Three relatively large rivers will either be crossed or approached by the proposed Interstate, the Patoka River and the East and West Forks of the White River. Some tree clearing would occur during construction at the two river crossings. Construction of bridges at these locations will permanently remove some suitable habitat from future use.

      Impacts will be reduced or avoided via proposed conservation measures.

- Known Bald Eagle Nests & Winter Use Sites in Relation to Direct Impacts

    - At this time, there are no known, recorded bald eagle nests within the Bald Eagle Action Area for the proposed project.
    - There are two nests along the South Fork of the Patoka River, near the proposed crossing of the Patoka River. Both nests are most likely within the same breeding area of a single pair of eagles. The nests are on property owned by the Patoka River National Wildlife Refuge. The tertiary zone boundaries for both nests are over 1 mile from the proposed corridor and outside the Action Area for the proposed project.

- There are no nests near the proposed crossing of the East Fork of the White River. The closest nest is approximately 8 miles upstream. The East Fork of the White River in Daviess County is surveyed as part of the IDNR Midwinter Bald Eagle Survey. This area appears to be a relatively unimportant wintering site, with a 10-year average of only 0.6 eagles.

- There are no expected direct effects from construction to individual bald eagle use areas as part of the proposed project. However, updated records checks and bald eagle surveys will be completed as needed. If a bald eagle nest or its associated management zones, or a winter use site are found within the corridor at a later time, individuals of the species could be affected by the proposed project.

OPERATION

- Interstate Traffic

  YEAR ROUND
  - Project operation could cause some number of bald eagle mortalities from vehicular collisions, especially in winter when food is scarce and bald eagles scavenge carrion on roadways. However, it is not anticipated this will be a severe impacts or negatively affect the population of this species. Risks of vehicular collision are influenced by the roadside landcover (forested corridors present higher risk due to limiting avoidance movements) and no bald eagle killed by a vehicle has been reported to INDOT along Indiana Interstates although isolated instances have occurred in the Toll Road District in northern Indiana.
  - Also, increased highway noise and lights, particularly near the crossings of the East Fork of the White River and the Patoka River area, could deter bald eagles from nesting in otherwise appropriate habitat near those areas.

- Increased Public Awareness of Bald Eagles

  YEAR ROUND
  - Public awareness of bald eagles, their life history requirements, and threats to the species is likely to increase as a direct result of educational pamphlets and interpretive displays that FHWA and INDOT have proposed to have designed and plan to distribute/display at public rest stops along I-69.

Indirect Effects

CONSTRUCTION, OPERATION, AND MAINTENANCE

- Induced Commercial and Residential Development
  - Development will occur as a result of the proposed Interstate. It is estimated that approximately 325 - 400 acres of forest and 10 – 30 acres of wetlands will be permanently lost to development that the Interstate will bring. Much of this will not occur in preferred bald eagle habitat, but a small portion may. At this time, it is difficult to estimate the amount of preferred bald eagle habitat that could be lost.
  - Development may result in water quality issues such as erosion, sedimentation, or contamination from pesticides, improperly treated sewage, or other accidental chemical spills all of which could lower the abundance and diversity of fish that bald eagles prey on.
  - Development may bring new utilities and associated power lines. This could potentially increase bald eagle mortalities from electrocution and tower collisions.
  - Increased access to Lake Monroe has the possibility of increasing recreation that could result in more disturbance to eagles using the area.

    If sufficient evidence warrants, recreational use and disturbance to eagles may be investigated further in Tier 2 studies.

- Water Quality

    - Erosion and sedimentation from areas of disturbed soil can degrade water quality, adversely affecting fish bald eagles feed upon. Servicing construction vehicles could cause an accidental chemical spill, and adversely affect water quality. Fugitive dust emissions could adversely affect area quality in the area of construction.
    - Highway accidents could result in a spill of hazardous materials into wetlands, or rivers/streams. Spills could be detrimental to the overall water quality, and in turn adversely affect fish the bald eagle feeds upon.
    - Road runoff may contain salts and chemicals that could degrade water quality and adversely affect the bald eagle food source.
    - Herbicides used in right-of-way and median areas could be ingested by bald eagle prey (fish) and bioaccumulate within the bald eagle.

  Impacts will be avoided or minimized by implementing equipment servicing and maintenance guidelines, contaminant spill, erosion-control, and herbicide use plans, following standard construction BMPs, and by installing containment roadside ditches as appropriate.

Discussion of Effects

Based on information to date, a potential adverse affect from this project to individual bald eagles is the risk of death from vehicle collisions during project operation. This risk is influenced by roadside landcover, where forested road corridors pose a greater risk for collisions by limiting an eagle on the roadway to only vertical avoidance movements. Open roadsides better enable eagles to avoid oncoming vehicles by moving horizontally out of the path. To date, no bald eagle has been reported as killed by a vehicle on an Indiana Interstate (other than the Toll Road or I-80/I-90 located in the extreme northeast corner of Indiana). Nonetheless, several have been found along the eastern end of the Toll Road District (INDOT – Chief of Operations Support). Another possible affect from project operation includes risk of water quality degradation from hazardous spills and maintenance chemicals. Water quality directly affects fish, the species' primary food source.

There are no reported bald eagle nests within the Action Area (1 mile on either side of the proposed corridor) of the project. Also, no primary, secondary, or tertiary buffer zones, as detailed in the Northern States Bald Eagle Recovery Plan (1983a), of any reported bald eagle nests intersect the proposed 2000-foot corridor. The Action Area is double the distance of the standard tertiary buffer zone. There are currently three bald eagle nests (two within the breeding area of a single pair of eagles) just over 1 mile from the proposed corridor, one on the West Fork of the White River near Waverly in Morgan County and two along the South Fork of the Patoka River near the proposed crossing of the Patoka River. Construction of the proposed Interstate will be outside any recommended buffer zones needed to be protective of these nests.

Although the USFWS has proposed to delist the bald eagle from the threatened and endangered species list, habitat loss continues to be a concern for the species. The bald eagle will almost exclusively nest near relatively large, open water. Two areas that fit the description of preferred bald eagle habitat will be crossed by the proposed Interstate, the Patoka River bottoms area and the East Fork of the White River. Construction of the bridge at these locations, as well as the disturbance from light and noise from highway use may deter bald eagles from nesting in nearby areas. However, some bald eagles are tolerant of human disturbance, depending on the individual eagles as well as the time of year. The loss of habitat associated with the construction of the proposed bridge crossings will be minimal and is not likely to adversely affect bald eagles.

FHWA and INDOT will conduct additional, more detailed studies during Tier 2. Section 7 consultation will be conducted for each of the six project sections as part of Tier 2 studies. Bald eagle surveys within the action area will be conducted as part of these studies. If bald eagle nests are found within the action area during the surveys, the projects effects will be reassessed and reflected in a Tier 2 Biological Assessment.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered because they require separate consultation pursuant to section 7 of the Endangered Species Act.

Cumulative Effects within the Indiana Bat Action Areas

Reasonably foreseeable non-federal activities that are anticipated to occur within both the Summer and Winter Action Areas for the Indiana bat are timber harvest and planned development for residential subdivisions. Various departments and individuals were contacted by INDOT's consultants for such information. They included contacting the surveyor's office, recorder's office, auditor's office, highway superintendents, county and planning officials. In addition, the Tier 1 BA Addendum contained a cumulative effects analysis that used the Regional Economic Models, Inc. (REMI) to calculate projected population and employment changes in each of five economic zones within the I-69 study area for the year 2030. Growth for each region was delegated into Traffic Analysis Zones (TAZs). Figure 10 shows an example of TAZs for the Pigeon Creek Maternity Colony use area. Changes were calculated for both the No Build and the Build conditions. Population changes were converted to acreages by multiplying by a factor of 0.21 to 0.26 acres per household depending upon the region. Employment changes were converted to acreages by multiplying each by a factor of 0.05 to 0.065 acres depending upon the region. These factors were developed for each region based on various housing and commercial/industrial development factors. The No Build condition represents what is expected to occur without the proposed I-69 construction, and represents cumulative impacts in this analysis. The No Build scenario impacts subtracted from the Build scenario is equal to the indirect impacts attributed to I-69. REMI model results will also be used in each Tier 2 EIS indirect and cumulative impacts analysis, however the approach may differ slightly.

Expert land use panels reviewed the REMI model results and either concurred with model results, or suggested adjustments based on their expectations of development. These panels consisted of developers, local city and county planning staff, and economic development personnel.

In addition to cumulative impacts generated by the REMI model, impacts to tree cover from possible legal drain dredging were estimated and included in addition to the model based cumulative impacts. These impacts could potentially occur regardless of the I-69 construction. Legal drains were identified through consultation with county officials as those streams legally maintained by the county or maintained through privately funded groups. For this analysis, impacts were assumed to be 75 feet from either side of a legal drain. The legal drain impacts represent a "worst-case" scenario for tree cover impacts as not all legal drains are likely to be maintained, and maintenance may not result in impacts on both sides of the stream, or the entire 75 feet.

We typically can not accurately quantify how much forest land on private lands will be converted to other habitat types, the extent of future timber harvests on private lands, nor the amount of privately owned habitat that will be developed for other purposes. However, we can look at the trends state-wide and extrapolate assumptions as to how the private lands within the Action Areas will likely be managed in the foreseeable future.

The following Indiana forest trends were highlighted within the North Central Research Station's 2005 report, "Indiana Forests: 1999-2003, Part A". Trends that we believe may be of a net benefit to Indiana bats have been *italicized* below:

- *There are no major tree die-offs anywhere in the state; natural tree mortality appears evenly across the state.*
- *The ratio of harvested tree volume to tree volume growth indicates sustainable management.*
- *Diverse and abundant forest habitat (snags, coarse woody debris, forest cover and edges) support healthy wildlife populations across the state.*
- *Indiana possesses a diversity of standing dead tree wildlife habitat with an abundance of recently acquired snags to replenish fully decayed snags as Indiana's forests mature.*
- Indiana's oak species continue to grow slower than other hardwood species.
- The average private forest landholding dropped from 22-acres in 1993 to 16-acres in 2003, indicating a continued "parcelization" of Indiana forests.
- Introduced or invasive plant species inhabit a majority of inventories plots.
- The amount of forest edge doubled from 1992 to 2001, indicating smaller forest plots.
- Due to land use history and natural factors, the forest soils of southern Indiana are generally below-average in quality.
- Although Indiana's overall forested land mass is increasing, the rate of increase has slowed over the past decade.
- *Indiana's forests continue to mature in terms of the number and size of trees within forest stands.*
- Increases in total volumes of oak species are less than those for most other hardwood species.
- The advanced ages and inadequate regeneration of Indiana's oak forests may signal a successional shift from an oak/hickory-dominated landscape to one where other hardwood species, such as maples, occupy more forested areas.
- Indiana's hardwood saw-timber resource continues to be at risk due to maturing of hardwood stands, loss of timberland to development and new pests (gypsy moth, emerald ash-borer, sudden oak death, beech-bark disease, and more).
- Ownerships of Indiana forests have changed in the past decade, resulting in more parcelization and fragmentation.

While the data shows there has been loss of continuous forest, resulting in smaller, fragmented stands, there is also an overall increase in forested land across the state.

Timbering data was requested from the Division of Forestry of the Indiana Department of Natural Resources. Discussions showed that there was no organized method of tracking timbering in any of the counties except possibly Monroe County. The Planning Department of Monroe County disclosed that permits were sporadic and voluntary, and much of the timbering goes undocumented. Thus, field surveys from the mid-1990's to the present were reviewed for a general understanding of timbering activities in the Action Areas. Within the Action Areas, the majority of forests are found in the Crawford Upland, Mitchell Plain, Norman Upland, and Martinsville Hill physiographic regions. These regions include for the most part Greene, Monroe and Morgan counties.

Timbering is limited and sporadic in the Action Areas. Observations throughout many years indicate that cutting is for the most part selective and that much of the timber in the area is second growth indicating past activities. Classified forests are common and many in the Action Areas and allow for the management of timber, especially selective cutting. One area that showed timbering was east of US 231 at Doan's Creek in Greene County. At this location, less than an acre of woods was cut for black walnut. Another area included the timbering of hardwood southwest of Cincinnati in the American Bottoms. Downed trees were abundant and timbering included less than 20 acres. From such observations and discussions with county officials, timbering is not expected to be a major contributor to the loss of woodland within the Action Areas.

Many planned residential subdivisions were investigated to ascertain potential forest losses in the Action Areas. <u>There were approximately 100 plus planned and currently expanding subdivisions still being built within the Action Areas</u>. The bulk of these developments were located in the northern portion of the Action Area just south of Indianapolis, in non-forested areas along SR 37. In the Wabash Lowland Region (i.e., Vanderburgh, Warrick, Pike, Gibson and Daviess counties), forests were for the most part in woodlots surrounded by farm fields. In addition, many of these are forested wetlands and/or in flood prone areas. The majority of the few subdivisions recorded were developed upon previously cleared lands, not forestlands.

In the heavily forested counties of Greene, Monroe, and Morgan, subdivisions were for the most part in developed lands with some exceptions. The major exceptions include the proposed Clifty Hills and Blue Ridge Estates in eastern Greene County and the Stonebridge Club along SR 37 in Morgan County. The development of such properties could potentially take many acres of forest. Other smaller planned subdivisions in Greene County are Lawrence Hollow Estates, Deer Lake, and Green Hills Estates South. These three subdivisions would take much less forested acres.

Monroe County and Morgan County have a number of subdivisions planned; however, many of these are near SR 37 in open lands surrounding the city of Bloomington. Examples of planned subdivisions in Monroe County are Farmers Field Acres, Rolling Glen Estates, Harrell Road Subdivision, and Orchard Estates in the vicinity of Hindustan. In Morgan County, a few examples of planned subdivisions are Turkey Knob, Country Club Woods, The Oaks and the Stonebridge Club. Most of the subdivisions located within the Action Areas take marginal acres of forestland.

Most of the planned subdivisions in the Action Areas were found in open lands of the Tipton Till Plain within Marion County and Johnson County. Some example of planned subdivisions in Marion County are Willingshire Community, Bluffs Subdivision, Bayberry Village, Silver Springs Subdivision, Governor's Pointe Subdivision, Ridgehill Trail Subdivision, and Thompson Meadows

Subdivision. Examples in Johnson County are Shadowood, Woods at Somerset, Smokey Row Estates, Manor at Somerset, Persimmon Woods, and Northridge. Many of these subdivisions were located around existing subdivisions in the area and are part of the Indianapolis metropolitan area.

A review of the potential for loss of forest due to timbering and residential development in the Action Areas showed limited timbering and many planned subdivisions; however, the majority would be located on open lands with limited forestland impacts. The only exception appeared to be Clifty Hill and Blue Ridge Estates northeast of Koleen. Timbering and residential development could potentially remove possible roost and foraging habitat for the Indiana bat. Specific acres of forest loss will be addressed in Tier 2 studies, as needed.

We anticipate decline in bat habitat in some areas of the Summer and Winter Action Areas in the future, although we are not aware of specific development plans in known bat habitat at this time. As we become aware of specific projects, impacts to Indiana bats will be addressed through the incidental take permit process, if appropriate.

Areas set aside for mitigation plantings will protect those areas from development in the short term, and in the long term will provide quality roosting and foraging habitat. These areas will also help to decrease habitat fragmentation, and to improve the potential for colonies of Indiana bats currently using the action area to expand into other areas of suitable habitat. As of August 2006, INDOT had contributed some financial assistance along with the Patoka River National Wildlife Refuge towards the purchase of a key parcel of land containing high quality summer habitat for the Patoka River Maternity Colony of Indiana bats (e.g., INDOT helped to purchase a 20-acre parcel that contained the colony's primary roost tree). INDOT had also installed chain-link fencing beneath the end abutments of one of its large bridges in the SAA to protect Indiana bats that were found roosting there from potential human disturbance/vandalization. Both of these initial mitigation efforts should benefit Indiana bats in those areas and minimize the potential for future take.
With successful implementation of the revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan and all of the other proposed mitigation efforts and conservation measures, we anticipate that long-term habitat conditions for the Indiana bat maternity colonies, individuals and hibernating populations within the action areas will be sustainable and in limited situations may be better than existing conditions. However, because the level of success in implementing the proposed habitat mitigation is largely dependent on the willingness of key private landowners to cooperate with INDOT representatives, uncertainty remains as to the ultimate outcome and value of these efforts towards bat conservation.

Additional cumulative effects, such as current levels of unauthorized visitation at Indiana bat hibernacula in the WAA, will be further investigated and addressed in Tier 2 project-section consultations.

Cumulative Effects within the Bald Eagle Action Area (not revised)

Current and reasonably foreseeable non-federal activities that may occur within the Bald Eagle Action Area are timbering, planned development for residential subdivisions, and recreational activities that occur along open waterways. Various departments and individuals were contacted for such information. They included contacting the surveyor's office, recorder's office, auditor's office, highway superintendents, county and planning officials. Because, the Bald Eagle Action Area falls completely within the Indiana Bat SAA, the cumulative effects from timbering and planned residential subdivisions are essentially the same as those mentioned above for Indiana bats. Timbering and residential development is not expected to remove optimum nesting and perching sites for bald eagles as these primarily occur in riparian buffers and flood-prone areas.

Most water-based recreation activities (e.g., boating, jet skiing, and fishing) that occur near sensitive areas used by bald eagles are concentrated at large public reservoirs, such as Lake Monroe in Monroe County. Other areas associated with bald eagles such as the East Fork White River, West Fork White River, and Patoka River are frequented by motor boats less often than Lake Monroe. The majority of the recreation activities conducted along these rivers is associated with smaller motorized boats and canoes. Repeated disturbances from recreation activities near lakes and rivers may disrupt nesting eagles and potentially cause nest abandonment. Additional cumulative effects (if any) will be investigated and addressed in Tier 2 studies and project-section consultations.

VI. CONCLUSION

(Our non-jeopardy conclusion regarding impacts to the bald eagle still stands as stated in the original December 3, 2003 BO.)

After reviewing the current status of the Indiana bat, the environmental baseline for the action areas, the aggregate effects of the proposed construction, operation, and maintenance of the interstate and associated development, and the cumulative effects, **it is still the Service's biological opinion that Alternative 3C of I-69 from Evansville to Indianapolis, as proposed, is not likely to jeopardize the continued existence of the Indiana bat, and is not likely to destroy or adversely modify its designated Critical Habitat.**

Our basis for this conclusion follows:

- The 13 Indiana bat maternity colonies in the SAA represent 0.4% of the total estimated number of maternity colonies in the species' range in 2005 (n=2,900 colonies, see Table 5). In theory, even if I-69 were to destroy many or even all of these colonies (which it most certainly will not), it would not likely constitute an appreciable reduction in the species' numbers (0.4% of colonies) nor an appreciable reduction in the species' range, since Indiana's caves annually shelter nearly half of all known Indiana bats across the range (45% of all *M. sodalis* hibernated in Indiana in 2005). Furthermore, no appreciable reduction in the species' overall reproductive rate is anticipated; only a short-term reproductive loss within some of the 13 affected colonies is likely to occur.
- Because I-69 will have a long narrow/linear footprint, the amount of adverse impacts to any one habitat patch or maternity area along its path is minimal when compared to impacts of a similarly sized area that has a non-linear configuration.
- In general, areas with less than 5% forest cover are not capable of sustaining an Indiana bat maternity colony. The construction of I-69 will directly reduce the total amount of forest habitat/tree cover available around each of the 13 colonies and in some cases will cause small additional amounts to be indirectly lost by induced development. When combined, the percentages of existing tree cover that will be directly and/or indirectly impacted at each

maternity colony is very small. Ten of the 13 colonies will lose less than 1% of their tree cover, and the other three will lose 1.4%, 1.5% and 2.9%. So, the total amount of forest loss is insignificant for each colony.

- Thirty-two roost trees/sites were identified during Indiana bat radio-tracking studies for I-69 in 2004 and 2005. None of these 32 roosts will be directly impacted by the interstate. Furthermore, the I-69 corridor avoids running near or through the central roosting area in 7 out of the 13 maternity areas or 77% of the time. Therefore, we do not believe that any of the 13 maternity colonies will be displaced by the interstate. Because the proposed 3:1 mitigation commitment for upland forest losses will largely be focused on improving forest habitats within the maternity colony areas, we have further confidence that any adverse impacts to these colonies will be minimal and should not be long lasting.
- We estimated the maximum overall amount of I-69 related incidental take of Indiana bats within the SAA to be no more than 286 bats (236 females/juv. and 50 males) spread over a 17-year long period. So on an annual basis, this equates to about 17 bats being taken per year in the SAA, which is less than 1% of the bats that occupy the SAA each summer.
- The Proposed Action will only directly or indirectly take or otherwise reduce the fitness of a relatively small number of bats (estimated total = 857 bats over a 17-year long period or about 50 bats/year) within the WAA and will only have minimal, short-term effects on these bats' respective maternity colonies and hibernating populations. The estimated amount of take only represents 1.2% of the *annual* winter population within the WAA. Similarly, loss of these individuals will have no adverse effect on the viability of other maternity colonies in the region or the species' range or to hibernating populations to which these individuals belong. So again, the Proposed Action in combination with relatively small amounts of cumulative impacts/take is not reasonably expected, directly or indirectly, to cause an appreciable reduction in the reproduction, numbers or distribution of the Indiana bat as a species.
- The combined estimated amount of I-69-related take (SAA + WAA) and estimated take from cumulative effects equals 2,111 bats over a 17 –year period. Again, we believe this level of take is insignificant because it equates to less than one-half of one percent (0.46%) of the 2005 range-wide population estimate of *M. sodalis*.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are **non-discretionary**, and must be undertaken by the FHWA or their designee (e.g., INDOT) for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

INDIANA BAT

AMOUNT OR EXTENT OF TAKE

The Service believes it is reasonably certain to anticipate that incidental take of Indiana bats will occur as a direct or indirect result of the Proposed Action in the following forms:

- death/kill and/or injury/wound from direct felling of occupied trees (during indirect/induced development),
- death/kill and/or injury/wound from direct collision with vehicles traveling on I-69 once it is operational (i.e., roadkill),
- death/kill/wound/harassment of hibernating Indiana bats in unprotected Indiana bat hibernacula as an indirect result of project-induced population growth and increased vehicular accessibility to hibernacula areas,
- harassment of roosting bats from noises/vibrations/disturbance levels causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time, and
- harm through loss of roosting habitat such as primary and/or alternate roost trees, and loss of foraging habitat.

Based on our knowledge of the ecology of Indiana bats, and the distribution of Indiana bats within the Summer and Winter Action Areas of I-69, we assume that the habitat that will be lost will adversely affect the roosting and foraging habitat of Indiana bats.

Based on our analysis of the environmental baseline and effects of the proposed action, the Service anticipates that 13 Indiana bat maternity colonies occupy the SAA and therefore may be impacted as a result of the proposed activities. The effect of the loss of foraging habitat is expected to result in the death of some bats (e.g., as the result of exposure to predation or overwinter mortality of bats that failed to store adequate fat reserves). Loss of roosting habitat and degradation of remaining habitat may also result in harm of individual bats. While some adverse effects are not expected to directly result in the death of bats, they may exacerbate the effects of other ongoing stressors on the bats. Collectively, the effects of the action are expected to result in behavioral or physiological effects which impair reproduction and recruitment, or other essential behavioral patterns. We anticipate take/death of individuals, decreased fitness of individuals, reduced reproductive potential, and reduced overwinter survival of an estimated maximum of 337 Indiana bats within the SAA and 857 Indiana bats in the WAA as detailed in Tables B4 and B5 in Appendix B, respectively. The effects on the 13 known maternity colonies may be lost reproductive capacity and potentially a short-term decline in their colony sizes. No significant, long-term adverse effects to affected maternity colonies are anticipated.

Construction of I-69 along the proposed 3C alignment and its associated actions is expected to result in the permanent loss of approximately 2,170 acres of suitable summer foraging and roosting habitat for Indiana bats. This estimate includes 2,050 acres of upland and bottomland forest, 100 acres of forested wetlands, 5 acres of scrub-shrub wetlands, and 15 acres of emergent wetlands. Degradation of remaining habitat is also likely to occur from increased fragmentation and increased disturbance.

It is unlikely that direct mortality of small-sized bats will be detected, that is, we do not expect that most dead or moribund bats are likely to be found as the project activities are being conducted, even though we expect that up to 1,143 individuals may be taken as a result of the proposed actions. Therefore, the anticipated levels of take primarily are being expressed below as the permanent, direct loss of currently suitable summer roosting and foraging habitat in the SAA and fall swarming and staging habitat in the WAA for Indiana bats that will result from project implementation as estimated in the Tier 1 BA Addendum. In short, we will exempt anticipated levels of take by using the affected habitat acreages as a surrogate as summarized below.

<u>Summer Action Area</u>:
Permanent direct loss of up to 2,148 acres of forest habitat and 20 acres of non-forested wetlands is anticipated. Approximate direct loss of Tier 2 Forest (from Table 3 of the BA Addendum) within each project section is summarized in Table 1 below.

Table 1. Estimated direct loss of Tier 2 Forest within the I-69 Summer Action Area.

Project Section	Direct Loss of Tier 2 Forest (acres)
1	55
2	280
3	112
4	1,132
5	303
6	266
Total	**2,148**

Winter Action Area:
Permanent direct loss of up to 1,097 acres of forest habitat surrounding 14 of the 15 known hibernacula (doesn't include area surrounding Cave) is anticipated (from the revised version of Table B-3 in Appendix B of the BA Addendum). Approximate direct loss of Tier 2 Forest within a 5-mile radius of each hibernaculum is summarized in Table 2 below. The sum of the individual acreages is greater than 1,097 acres because of a high degree of overlap among the impacted acres surrounding the hibernacula.

Table 2. Estimated direct loss of Tier 2 Forest within a 5-mile radius of each hibernaculum within the I-69 Winter Action Area.

Hibernaculum Name	Direct Loss of Tier 2 Forest (acres)
Cave:	631
Cave:	556
Cave:	522
Cave:	463
Cave :	431
Cave:	327
Cave:	350
Cave:	288
Cave System:	238
Cave:	98
Cave:	97
Cave:	85
Cave:	51
Cave:	0
Cave:	0

Roadkill:
The Service anticipates that all bats that are struck by vehicles likely will be killed. The Service assumes that the annual number of deaths by vehicle collisions is not likely to exceed 11 Indiana bats per calendar year. However, based on the best available scientific data, the actual number of Indiana bats that may be struck and killed from vehicles traveling on I-69 between Evansville and Indianapolis can not be precisely quantified and dead bats will be difficult to locate once I-69 is operational. If more specific information becomes available, then this issue will be reexamined during the Tier 2 project-section consultations and prudent adjustments will be made at that time.

EFFECT OF THE TAKE
In the accompanying biological opinion, the Service determined that the aggregate level of anticipated take is not likely to result in jeopardy to Indiana bats or destruction or adverse modification of designated Critical Habitat (i.e., Cave).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of Indiana bats:

1. In the Tier 1 BA Addendum, the FHWA proposed to investigate and/or implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of wildlife species, including Indiana bats. The Service will take the necessary steps to ensure that the FHWA successfully implements all the conservation measures to the fullest extent practicable.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

3. All I-69 construction personnel and INDOT maintenance staff need to be made aware of potential issues concerning Indiana bats and construction and maintenance of I-69.

4. The FHWA needs to ensure that the impacts of take associated with future Tier 2 section-specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented and anticipated levels of incidental take will not be exceeded nor will any new forms of take occur that were not anticipated in Tier 1.

The Service believes that the measures above are necessary, appropriate, and reasonable for minimizing take of Indiana bats.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA (and/or INDOT and their contractors or assigns) must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. The FHWA must implement all proposed mitigation and conservation measures, as detailed in the revised "Tier 1 Forest and Wetland Mitigation and Enhancement Plan" and "Conservation Measures for Impacts to Threatened and Endangered Species" sections of the Tier 1 BA Addendum and Appendix B of the Tier 1 BA or alternative measures that are of equal or greater benefit to Indiana bats as developed in consultation with the Service during Tier 2.

2. FHWA will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service's BFO by 31 January each year (the first report will be due 1/31/07) and reporting will continue for at least 5 years post-construction or until otherwise agreed to with the Service.

   If proposed conservation measures or mitigation goals can not be realized (e.g., lack of willing-sellers), then FHWA will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to Indiana bats within the Summer and Winter Action Areas.

3. All I-69 engineering supervisors , equipment operators, and other construction personnel and INDOT (and/or concessionaire) maintenance staff will attend a mandatory environmental awareness training that discloses where known sensitive Indiana bat sites are located in the project area, addresses any other concerns regarding Indiana bats, and presents a protocol for reporting the presence of any live, injured, or dead bats observed or found within or near the construction limits or right-of-way during construction, operation, and maintenance of I-69.

4. To ensure that the impacts of take associated with future Tier 2 project-section specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented, the FHWA and the U.S. Fish and Wildlife Service will implement an appended programmatic consultation approach for I-69. Under that approach this programmatic Biological Opinion and Incidental Take Statement will exempt incidental take that result from the implementation of site-specific actions that result from implementation of the proposed action as detailed in the Tier 1 BA and the Tier 1 BA Addendum. However, specific impacts within each Tier 2 Project Section must be individually reviewed by the Service to determine if they are consistent with this programmatic Incidental Take Statement's reasonable and prudent measures and associated terms and conditions, and to ensure that site-specific impacts of the resulting incidental take are minimized. If effects of an individual Tier 2 Project Section are found to be consistent with those analyzed in the programmatic consultation, then it will be appended to this programmatic Biological Opinion and Incidental Take Statement, along with any additional project section-specific reasonable and prudent measures and terms and conditions that are needed to fulfill the requirements of section 7(a)(2). No incidental take shall be exempted until after a Tier 2 Project Section's BA has been reviewed, found to be complete and consistent with Tier 1 findings, and has been appended to the programmatic BO by the Service.

   Because acreages of lost Indiana bat habitat are being used as a surrogate to monitor levels of incidental take within the entire Summer and Winter Action Areas as well as within each Tier 2 Project Section and 5-mile radius around each known hibernaculum, the FHWA will provide the Service's Bloomington Field Office with a detailed description of each project section's contribution to habitat loss by preparing a Tier 2 Biological Assessment for each project section. The Tier 2 Biological Assessments must include: maps of the preferred final alignment and all associated development; methods and results of Tier 2 mist net surveys, radio-tracking studies, roost tree emergence counts, and hibernacula surveys; exact locations of all known and newly discovered Indiana bat roost trees and hibernacula (hibernacula location maps must identify known hydrologically connected surface streams and sinkholes and their drainage basins and delineate approximate boundaries of potential recharge areas for each hibernaculum within the WAA in relation to I-69's direct and indirect impacts as identified during Tier 2 and previous studies); the total acreages and relative quality of forest (e.g., maturity of forest/estimated dbh of live canopy trees and estimated suitability for roosting/estimated number and dbh of snags) and wetland habitats that will be directly impacted and permanently cleared/filled; and all other anticipated project section-specific impacts. Tier 2 BAs must also describe any additional direct or indirect effects that were not considered during the Tier 1 programmatic-level consultation. To reduce redundancy, Tier 2 BAs should summarize or simply reference sections of the Tier 1 BA and BA Addendum that would otherwise be repetitive.

Each Tier 2 BA must quantify how the individual Tier 2 Project Section's direct impact acres contribute to the estimated project section-specific and hibernacula-specific acres (see Tables 1 and 2 above) as well as to the project-wide forest acres (2,148 ac.) and non-forested wetland acres (20 ac.) as specified in the AMOUNT OR EXTENT OF TAKE section above. The Tier 2 BAs should also report how much total acreage remains for the overall I-69 project and within each project section in the SAA and hibernacula in the WAA (i.e., provide the running totals and the remaining balances for these exempted levels of take).

FHWA's cover letters requesting Project-Section specific ESA Section 7 reviews must include a determination of whether or not the proposed project is consistent with this Programmatic Biological Opinion and Incidental Take Statement and request that the proposed Tier 2 BA be appended to this Programmatic Biological Opinion. The cover letter, and one bound hard copy and an electronic copy of the Tier 2 BA should be submitted to the BFO when requesting a project section review.

5. Any dead bats located within the construction limits, right-of-way, rest stops, or mitigation areas of I-69, regardless of species, should be immediately reported to BFO [(812) 334-4261], and subsequently transported (frozen or on ice) to BFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to BFO. BFO will make a species determination on any dead or moribund bats. If an Indiana bat is identified, BFO will contact the appropriate Service Law Enforcement office as required.

   The FHWA will keep track of all known Indiana bats killed from vehicle collisions to ensure that the anticipated amount of incidental take, <u>11 killed per calendar year,</u> is not exceeded.

<u>ATTENTION</u>: If at any point in time during this project, the exempted project-wide or section-specific, or hibernacula-specific habitat acreages or annual number of roadkilled bats quantified in the AMOUNT OR EXTENT OF TAKE section of this ITS are exceeded by more than 10%, then the Service will assume that the exempted level of take for this project may have been exceeded and the FHWA should immediately reinitiate formal consultation.

In conclusion, the Service believes that the permanent loss of currently suitable summer roosting and foraging habitat for Indiana bats will be limited to 2,148 acres of forest habitat and 20 acres of non-forested wetlands within the SAA (SAA) and 1,097 acres of forest habitat within the Winter Action Area (WAA). These acreages represent approximately a 1% loss of the SAA's forested acreage and a 1% loss of the WAA's forested acreage and will occur over a period of at least several years. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded (or tree clearing occurs during the period April 15-September 15 in the SAA or April 1-November 15 within the WAA any given year) such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

BALD EAGLE

AMOUNT OR EXTENT OF TAKE

The Service anticipates that incidental take of bald eagles will occur in the form of death or injury resulting from collisions with vehicles once I-69 is operational. Based on the best available scientific data, the actual number of eagles that may be struck and killed/injured from vehicles traveling on I-69 between Evansville and Indianapolis can not be precisely quantified. The Service anticipates that collisions with eagles would most likely occur during the winter when food is more scarce and eagles are more apt to scavenge on carrion from roadkilled animals. Once I-69 is operational, we anticipate that all eagles that are struck by vehicles will be killed or injured and that the number of deaths and/or injuries would not exceed 3 bald eagles during any five-year period. Because bald eagles are large birds and would be widely recognized by most motorists and maintenance workers, we anticipate most roadkilled or injured eagles would eventually be reported to the Service, and therefore, the actual level of incidental take could be fairly accurately monitored over time.

The amount of forested habitat that will be permanently cleared for construction of bridges at the two major river crossings (E. Fork of White River and Patoka River, where bald eagles are most likely to occur) was not quantified in the Tier1 BA. However, from our review of aerial photos and maps of the project area, we anticipate that the total combined amount of forest that will be lost at these two river crossing will be equal to or less than 50 acres and that an ample amount of habitat will remain available to bald eagles in these areas. Furthermore, the potential for incidental take from loss of future eagle habitat will be minimized by the proposed forest and wetland mitigation efforts. Therefore, we believe that if forest loss at these sites is equal to or less than 50 acres, then the impact will be insignificant in size and not likely to adversely affect nesting or wintering eagles.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to bald eagles. No critical habitat has been designated for bald eagles, so none would be impacted.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of bald eagles:

1. In the Tier1 BA, the FHWA proposed to investigate and/or implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of

wildlife species, including bald eagles. The Service will take the necessary steps to ensure that the FHWA successfully implements all the conservation measures to the fullest extent practicable.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

3. All I-69 construction workers and INDOT maintenance staff need to be made aware of potential issues concerning bald eagles and construction and maintenance of I-69.

4. The FHWA needs to ensure that the impacts of take associated with future Tier 2 project-section specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented and anticipated levels of incidental take will not be exceeded or that any new forms of take may occur that were not anticipated in Tier 1.

The Service believes that the measures above are necessary, appropriate, and reasonable for minimizing take of bald eagles.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA (and/or INDOT and their contractors or assigns) must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. The FHWA must implement all proposed mitigation and conservation measures, as detailed in the “Tier 1 Forest and Wetland Mitigation and Enhancement Plan” and “Conservation Measures for Impacts to Threatened and Endangered Species” sections and Appendix B of the Tier 1 BA or alternative measures that are of equal or greater benefit to bald eagles as developed in consultation with the Service during Tier 2.

2. The FHWA will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service’s BFO by 31 January each year (the first report will be due 1/31/07) and reporting will continue for at least 5 years post-construction or until otherwise agreed to with the Service.

   If proposed conservation measures or mitigation goals can not be realized (e.g., lack of willing-sellers), then FHWA will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to bald eagles within the Bald Eagle Action Area.

3. All I-69 engineering supervisors , equipment operators, and construction workers and INDOT (and/or concessionaire) maintenance staff will attend a mandatory environmental awareness training that discloses where known bald eagle nests are located in the project area, addresses any other concerns regarding bald eagles, and presents a protocol for reporting any eagle nests, and any live, sick, injured, or dead eagles observed or found within or near the construction limits or right-of-way during construction, operation, and

maintenance of I-69. Project personnel will also be instructed about the terms and conditions of the ITS and the restrictions imposed by them before construction and operation begins.

4. To ensure that the impacts of take associated with future Tier 2 project-section specific action are appropriately minimized and that the exemption of incidental take is appropriately documented, the FHWA and the U.S. Fish and Wildlife Service will implement an appended programmatic consultation approach for I-69. Under that approach this programmatic Biological Opinion and Incidental Take Statement will exempt incidental take that result from the implementation of site-specific actions that result from implementation of the proposed action as detailed in the Tier 1 BA. However, specific impacts within each Tier 2 Project Section must be individually reviewed by the Service to determine if they are consistent with this programmatic Incidental Take Statement's reasonable and prudent measures and associated terms and conditions, and to ensure that site-specific impacts of the resulting incidental take are minimized. If effects of an individual Tier 2 Project Section are found to be consistent with those analyzed in the programmatic consultation, then it will be appended to this programmatic Biological Opinion and Incidental Take Statement, along with any additional project section-specific reasonable and prudent measures and terms and conditions that are needed to fulfill the requirements of section 7(a)(2). No incidental take shall be exempted until after a Tier 2 Project Section's BA has been reviewed, found to be complete and consistent with Tier 1 findings, and has been appended to the programmatic BO by the Service.

   Because acreages of lost bald eagle habitat are being used to insure that habitat loss in eagle use areas (Patoka River and E. Fork White River crossings) does not reach the scale where take will occur, the FHWA will provide the Service's Bloomington Field Office with a detailed description of each project sections contribution to habitat loss by preparing Tier 2 Biological Assessments for each project section. The Tier 2 Biological Assessments must include: maps of the preferred final alignment and all associated development; methods and results of Tier 2 bald eagle surveys (i.e., current IDNR data should be sufficient), exact locations of all known and newly discovered eagle nests, night roosts, and other important areas; the total acreages and relative quality of forest (i.e., as compared to the maturity of forests and estimated suitability for nesting, perching, roosting in the immediate area) and wetland habitats that will be permanently cleared/filled. Tier 2 BAs must also describe any additional direct or indirect affects that were not considered during the programmatic consultation. To reduce redundancy, Tier 2 BAs should summarize or simply reference sections of the Tier 1 BA that would otherwise be repetitive.

   Each Tier 2 BA must track how the individual Tier 2 Project Section contributes to the forest acres quantified in the AMOUNT OR EXTENT OF TAKE section above and report how much total acreage is remaining per section and the project as a whole. Your cover letters requesting Project-Section specific reviews must include your determination that the proposed project is consistent with this programmatic Biological Opinion and Incidental Take Statement and request that the proposed Tier 2 BA be appended to this programmatic Biological Opinion. The cover letter, and one bound hard copy and an electronic copy of the Tier 2 BA should be submitted to the BFO when requesting a project section review.

5. Any dead bald or golden eagles found within the construction limits, right-of-way, rest stops, or mitigation areas of I-69, should be reported to BFO [(812) 334-4261] as soon as possible and subsequently transported (frozen or on ice) to BFO.

   Any sick or injured bald or golden eagle located within the construction limits, right-of-way, rest stops, or mitigation areas of I-69 should immediately be reported to BFO (and an Indiana Conservation Officer or the State Police if outside of normal business hours or on weekends). If possible, attempts should be made to remove an injured eagle from harms way, until a trained person arrives to safely capture and transport the bird. Sick and injured eagles will be transported to a veterinarian or a rehabilitation center that has a valid Federal permit to treat and rehabilitate eagles.

   BFO will contact the appropriate Service Law Enforcement office to report that a sick, injured, or dead eagle has been found.

   The FHWA will keep track of all known bald eagles killed or injured from vehicle collisions to ensure that the anticipated amount of incidental take, <u>3 killed/injured bald eagles during any five-year period,</u> is not exceeded.

   The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions specified herein.

In conclusion, the Service anticipates that the number of deaths and/or injuries from vehicle collisions would not exceed 3 bald eagles during any five-year period. If this level of take or less occurs, we expect that the effects to Indiana breeding and wintering bald eagle populations will be negligible. We anticipate that if 50 or less acres of forested habitat that will be permanently cleared for construction of bridges at the two major river crossings, East Fork of the White River and the Patoka River, where bald eagles are most likely to occur, then the impact will be insignificant in size and not likely to adversely affect nesting or wintering bald eagles. Impacts to eagle habitat will also be minimized by the proposed conservation measures and forest and wetland mitigation efforts. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action/program on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations generally do not focus on a specific project, but rather on an agency's overall program.

The Service provides the following conservation recommendations for the FHWA's consideration; these activities may be conducted at the discretion of FHWA as time and funding allow:

INDIANA BAT

1. Working with the Service, develop national guidelines for addressing Indiana bat issues associated with FHWA projects within the range of the Indiana bat.

2. Expand on scientific research and educational outreach efforts on Indiana bats in coordination with the Service's BFO.

3. In coordination with the BFO, purchase or otherwise protect additional Indiana bat hibernacula and forested swarming habitat in Indiana.

4. Provide funding to staff a full-time Indiana bat Conservation Coordinator position within the BFO, which has the Service's national lead for this wide-ranging species.

BALD EAGLE

1. Working with the Service, develop guidelines for addressing Bald Eagle issues associated with FHWA projects in the Midwest.

2. If delisted, provide funding to implement a bald eagle post-delisting monitoring plan in Indiana or throughout the Midwest.

3. Expand on educational and outreach efforts on bald eagles in Indiana.

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

REINITIATION NOTICE

This concludes formal programmatic consultation with FHWA on the construction, operation, and maintenance of the I-69 from Evansville to Indianapolis, Indiana and associated development. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that the may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action (e.g., highway construction and associated development) are subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

LITERATURE CITED

3D/International Inc. 1995. Environmental technical report: 1995 field studies for interim Indiana bat habitat mitigation at the Indianapolis International Airport in Marion County, Indiana. 23 pp. plus appendices.

American Geological Institute. 2001. Living With Karst: A Fragile Foundation. AGI Environmental Awareness Series 4. 64 pp.

Brack, V., Jr. 1983. The nonhibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Ph.D. dissertation, Purdue Univ., West Lafayette, Ind. 280 pp.

Brack, V. Jr, and R. K. LaVal. 1985. Food habits of the Indiana bat in Missouri. Journal of Mammology 66(2):308-315.

Brack, V. Jr, and K. Tyrell. 1990. A model of the habitat used by the Indiana bat (*Myotis sodalis*) during the summer in Indiana: 1990 field studies. Indiana Department of Natural Resources, Division of Fish and Wildlife, Endangered Species Program, Project E-1-4, Study No. 8. 42pp.

Brack, V., Jr, S. A. Johnson, and R. K. Dunlap. 2003. Wintering populations of bats in Indiana, with emphasis on the endangered Indiana Myotis, *Myotis sodalis*. Proceedings of the Indiana Academy of Sciences 112:61-74.

Brack, V., Jr., and J. Duffey. 2005. A 2004-2005 winter survey for Indiana bats (Myotis sodalis) in hibernacula of Indiana. Unpublished technical report prepared by Environmental Solutions, Inc and the Indiana Karst Conservancy for the Indiana Department of Natural Resources, Division of Fish and Wildlife, Wildlife Diversity Section. 91 pp.

Callahan, E.V., III. 1993. Indiana bat summer habitat requirements. M.S. Thesis. University of Missouri, Columbia. 84 pp.

Callahan, E.V., R.D. Drobney, and R.L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. J. Mammalogy: 78(3):813-825.

Castrale, J. and A. Holbrook. 2003. Indiana Department of Natural Resources Wildlife Management Notes. Indiana Department of Natural Resources, Mitchell, Indiana.

Clark, D.R., Jr., R.K. LaVal, and D.M. Swineford. 1978. Dieldrin-induced mortality in an endangered species, the gray bat (*Myotis grisescens*). Science 199:1357-1359.

Clawson, R.L. 2002. Trends in population size and current status in A. Kurta and J. Kennedy eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Cope, J. B., A. R. Richter, and R. S. Mills. 1977. Spring and Autumn Swarming Behavior in the Indiana Bat, Myotis sodalis. Journal of Mammology 58(1):93-95.

Dunlap, K. 2001. Population Trends of Indiana Bats in Indiana. Indiana Karst Conservancy Update 63:14-19.

Franson, J.C., Sileo, L., and N.J. Thomas. 1995. Causes of eagle deaths. In E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran and M.J. Mac eds. Our LivingResources. U.S. Department of Interior, National Biology Service, Washington, D.C.

Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991a. Summary of *Myotis sodalis* summer habitat studies in Illinois: with recommendations for impact assessment. Unpublished report prepared for the Indiana/Gray Bat Recovery Team Meeting, Columbia, Mo. Illinois Natural History Survey, Section of Faunistic Surveys and Insect Identification. 28 pp.

Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991b. Summer roost selection and roosting behavior of *Myotis sodalis* (Indiana bat) in Illinois. Unpublished report, Illinois Natural History Survey, Section of Faunistic Surveys and Insect Identification. 51 pp.

Garner, J. D., and J. E. Gardner. 1992. Determination of summer distribution and habitat utilization of the Indiana bat (Myotis sodalis) in Illinois. Final Report. Project E-3. Illinois Department of Conservation, Division of Natural Heritage and Illinois Natural History Survey, Center for Biogeographic Information. 25 pp.

Gray, H. 2000. Physiographic Divisions of Indiana. Indiana Universtiy, Indiana.

Gumbert, M.W., J.M. O'Keefe, and J.R. MacGregor. 2002. Roost site fidelity. In A. Kurta and J. Kennedy eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Hall, J.S. 1962. A life history and taxonomic study of the Indiana bat, *Myotis sodalis*. Reading Publ. Mus. Art., Gallery Publ. 12:1-68.

Hofmann, J. 1996. Indiana Bats in Illinois. INHS Reports, March-April 1996. Illinois Natural History Survey. Available: http://www.inhs.uiuc.edu/chf/pub/surveyreports/mar-apr96/bats.html (Accessed: February 5, 2003)

Homoya, M. A., Abrell, B. D., and J. R. Aldrich. 1985. The Natural Regions of Indiana. D.R. Winslow ed. Proceedings of the Indiana Academy of Science 94:245-268.

Hoosier National Forest (HNF). 2000. Programmatic Biological Assessment: Land and Resource Management Plan. Unpublished Report. Hoosier National Forest, Bedford, Indiana. 109 pp + Appendix.

Humphrey, S. R., A. R. Richter, and J. B. Cope. 1977. Summer Habitat and Ecology of the Endangered Indiana Bat, Myotis sodalis. Journal of Mammology 58(3):334-346.

Humphrey, S. R., and J. B. Cope. 1977. Survival rates of the endangered Indiana bat, *Myotis sodalis*. Journal of Mammology 58:32-36.

Kiser, J.D., J.R. MacGregor, H.D. Bryan, and A. Howard. 2002. Use of concrete bridges as nightroosts. in A. Kurta and J. Kennedy eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Kurta, A., D. King, J.A. Teramino, J.M. Stribley, and K.J. Williams. 1993. Summer Roosts of the Endangered Indiana Bat (Myotis sodalis) on the Northern Edge of its Range. American Midland Naturalist 129(1): 132-138.

Kurta, A., S. W. Murray, and D. H. Miller. 2002. Roost Selection and Movements Across the Summer Landscape in A. Kurta and J. Kennedy eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Lehman, R.N. 2001. Raptor electrocution on power lines: current issues and outlook. Wildlife Society Bulletin 29: 84-813.

Mumford, R. E., and J. O. Whitaker, Jr. 1982. Mammals of Indiana. Indiana University Press, Bloomington, Indiana. 537 pp.

National Speleological Society (NSS). 2003. Cave Life: Hey, What Lives Down There Anyway? Available: http://www.caves.org/grotto/mig/learn3.html (Accessed: June 17, 2003).

Pruitt, L. 1995. Summary of Jefferson Proving Ground bat surveys: 1993-1995. U.S. Fish and Wildlife Service, Bloomington Field Office, Unpublished report. 5 pp.

Rommé, R.C., K. Tyrell, and V. Brack, Jr. 1995. Literature summary and habitat suitability index model: components of summer habitat for the Indiana bat, *Myotis sodalis*. Report to Indiana Department of Natural Resources, Federal Aid Project E-1-7, Study No. 8. 38pp.

Rommé, R. C., A. B. Henry, R. A. King, T. Glueck, and K. Tyrell. 2002. Home range near hibernacula in spring and autumn. in A. Kurta and J. Kennedy eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Russell, A. L., C. Butchkoski, A. Tibbels, and G. F. McCracken. 2002. Bats, Road-Kill, and the FBI (Flat Bat Investigation). Bat Research News 43 (4): 180.

Sealander J. A., and G. A. Heidt. 1990. Arkansas Mammals. The University of Arkansas Press, Fayetteville, Arkansas. 308pp.

Tuttle, M.D. and J. Kennedy. 2002. Thermal requirements during hibernation. Pp. 68-78 *in* A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

U.S. Fish and Wildlife Service (USFWS). 1983a. Northern States Bald Eagle Recovery Plan. Bethesda, Maryland. 124 pp.

U.S. Fish and Wildlife Service (USFWS). 1983b. Recovery plan for the Indiana bat. Washington, D.C. 80pp.

U.S. Fish and Wildlife Service (USFWS). 1999. Agency Draft Indiana Bat (*Myotis sodalis*) Revised Recovery Plan. Fort Snelling, Minnesota. 53 pp

U.S. Fish and Wildlife Service (USFWS). 2002. Biological Opinion on the Application for an Incidental Take Permit for the Federally Endangered Indiana Bat (*Myotis sodalis*) for the Six Points Road Interchange and Associated Development. Unpublished Report. Bloomington Field Office, Bloomington, Indiana. 35 pp.

U.S. Fish and Wildlife Service (USFWS). 2003. An American success story for the new millenium. Available: http://midwest.fws.gov/eagle/ (Accessed: October 15, 2003).

Whitaker, J. O., Jr. 1996. Survey of Summer Bat Communities and Search for Endangered Bat Species at 21 Sites Along the Proposed Bloomington to Evansville Highway Route in Gibson, Pike, Daviess, Greene, and Monroe Counties in Southwest Indiana Highway Corridor - Draft EIS Appendices. Indiana Department of Transportation, Indianapolis, Indiana.

Whitaker, J.O., Jr., and V. Brack Jr. 2002. Distribution and summer ecology in Indiana. in A. Kurta and J. Kennedy eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

APPENDIX A:

OUTLINE AND DISCUSSION OF EFFECTS ON INDIANA BATS FROM THE ORIGINAL DECEMBER 3, 2003 BIOLOGICAL OPINION

INDIANA BAT

Below we have deconstructed the I-69 project into its various components and outlined the anticipated direct and indirect impacts and their effects on Indiana bats and bald eagles. The outline is organized by species, direct vs. indirect impact/effect, and phase of the project: construction, operation, or maintenance. The applicable time(s) of year is also indicated. After each adverse effect is a brief description of specific avoidance, minimization, and mitigation efforts that FHWA and INDOT have already taken or agreed to implement (or attempt to implement) in order to further reduce adverse effects and incidental take of Indiana bats and bald eagles within the action areas (these are shown in *italics*). The complete list of proposed avoidance and minimization measures is included in the "Conservation Measures for Impacts to Threatened and Endangered Species" subsection under the PROPOSED ACTION section above.

Direct Effects

CONSTRUCTION

- Tree/Forest Clearing

  SPRING/SUMMER/FALL

  - Mortality/Injury/Harassment of roosting bats – removal of a roost tree while Indiana bats are present would likely result in directly killing, injuring, and/or harassing individuals or a colony.

    FHWA/INDOT have agreed to abide by seasonal tree-cutting restrictions by not clearing any trees greater than 3 inches in diameter when bats are likely to be present: between April 15 and September 15 within the SAA or between April 1 and November 15 within the WAA. Therefore, little or no direct take of Indiana bats is anticipated from tree clearing during construction (or maintenance) of I-69. When possible, site-specific measures will be developed in consultation with the Service to avoid removing any primary and alternate roost trees located during Tier 2 surveys.

  - Permanent Loss of Roosting and Foraging Habitat – Estimates of direct loss of forest habitat were quantified in Table 8 (SAA) and Table 9 (WAA) in the Tier 1 BA and updated for this reinitiated formal consultation and are presented below in this document as Tables 5 and 6. Acres of existing forest were estimated within each of the six Tier 2 project sections (approximately 5-miles wide by variable length) and each circular areas around the 10 Indiana bat hibernacula (5-mile radius), then recalculated subtracting forest needing to be cleared within the proposed construction limits of the Tier 1 working alignment of 3C. Based on Tier 1 estimates, **a total of approximately 1299 acres of forest will be permanently lost from construction of Alternative 3C of I-69.** This only represents a loss of 0.91% of the existing forest within the entire SAA, losses within individual project sections would range from 0.15% (Project Section 6) to 1.8% (Project Section 4). Project Section 4 (between U.S. 231 and SR 37 in Bloomington) is the most heavily forested section of the

Table 5. Forest Landcover* in the Indiana Bat Summer Action Area for each Project Section Before and After I-69 Construction. (Comparative Recalcualtion of Tier 1 BA, Table 8)

	Section 1			Section 2			Section 3		
	Section	Section After I-69**	Diff	Section	Section After I-69	Diff	Section	Section After I-69	Diff
Forest Area (ac)	8,057	8,002	55	18,022	17,742	280	8,718	8,606	112
Total Area (ac)	45,985	45,175	810	89,912	88,227	1,685	80,972	79,000	1,972
% Forest Loss			0.68			1.55			1.28
% Forested Action Area	17.52	17.71	N/A	20.04	20.11	N/A	10.77	10.89	N/A
% Forested Working Alignment:			6.79			16.62			5.68%

	Section 4			Section 5			Section 6		
	Section	Section After I-69	Diff	Section	Section After I-69	Diff	Section	Section After I-69	Diff
Forest Area (ac)	53,714	52,582	1,132	33,447	33,144.0	303	19,957	19,691	266
Total Area (ac)	85,755	83,766	1,989	71,523	70,231	1,292	88,346	85,907	2,439
% Forest Loss			2.11			0.70			1.33
% Forested Action Area	62.64	62.77	N/A	46.76	47.19	N/A	22.59	22.92	N/A
% Forested Working Alignment:			56.92			23.45			10.91%

	Total Summer Action Area		
	Area	Area After I-69	Diff
Forest Area (ac)	141,915	139,767	2,148.0
Total Area (ac)	462,903	452,716	10,187
% Forest Loss			1.51
% Forested Action Area	30.66	30.87	N/A
% Forested Working Alignment:			21.09

Calculation Key		
Section	Section After I-69	Diff
A	C	A-C
B	D	B-D
		A-C / A *100
A/B*100	C/B*100	
		A-C / B-D*100

* Landcover was analyzed using a shapefile created from a smoothed USGS grid data interpreted from 1992 LANDSAT images with 30-m resolution outside the project corridor, and EEAC forest inside the corridor.

** Calculations of Landcover After I-69 were done by subtracting the Tier 2 Representative Alignment.

project and would lose the most acres of forest (976.5 ac), which represents 1.8% of the existing forest within this section of the SAA. Comparisons of the percent of the working alignment forested to the percent of the landscape forested indicate successful forest avoidance in all sections with the exception of Section 4 where these percentages are very close. Because bats exhibit site fidelity to roosts and forage sites, potential exists, especially for pregnant females, to suffer stress searching for new roosting and foraging areas. It has been hypothesized that this stress could cause lower fat reserves and less successful reproduction and winter survival (USFWS 2002).

Based on Tier 1 estimates, **construction of I-69 would cause the permanent loss of approximately 947 acres of forest habitat within the WAA, which represents less than 1 percent (0.95%) of the 99,502 acres of currently existing forest in the area**. Collectively, 59% of the WAA is forested. The percentage of fall swarming/spring staging/forest habitat that would be lost around each hibernaculum ranges from 0.19% (50 acres) for Cave to 1.39% (364 acres) for Cave. The three hibernacula that would loss the least percent of surrounding forest are (0.39%), (0.33%) and (0.19%) caves. Loss of forest habitat around a hibernaculum can result in a reduced capacity to support a local hibernating population.

When possible, FHWA/INDOT avoided forest and wetland areas when developing the working alignment of Alternative 3C. They have also agreed to mitigate for the permanent and unavoidable loss of forests (3:1 ratio) and wetlands (ratios in Table 2) within the action areas by purchasing existing habitat, and/or creating, restoring, and enhancing habitat. Based on Tier 1 estimates of impacts, the committed mitigation acreage would total approximately 4,089 acres (Table 2). In Tier 2, this number may change. The actual mitigation acres will be determined based on impact acres and the committed ratios which could provide higher or lower mitigation acres than the amount estimated in the Biological Assessment. All mitigation areas would be monitored for at least 5 years and permanently protected via conservation easements. Efforts will be made to mitigate in locations that will directly benefit individual bats likely to be impacted by the project. Specific sites will be finalized in consultation with the Service after Tier 2 surveys have revealed where important Indiana bat areas are located (e.g., maternity colonies, and new hibernacula). Opportunities will be investigated to benefit Indiana bats by purchasing additional summer/fall/spring forest habitat within the action areas from "willing-sellers" and turning it over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. Therefore, the adverse affects to Indiana bats within the action areas from the loss of summer/swarming/staging roosting and foraging habitat may be minimized. There is uncertainty as to what proportion of land owners with forested property within the action areas will be willing-sellers.

In addition, FHWA/INDOT have identified as potential mitigation sites two properties totaling 1,180 acres (approx. 740 acres of forest) located outside of the action areas. While valuable to the species, this "off-site" summer habitat (and potentially caves/winter hibernacula) is not likely to benefit Indiana bats within the I-69 action areas and therefore was only considered as a beneficial effect within the context of the Service's jeopardy analysis.

- Forest fragmentation - The 3C alignment will increase the degree of forest fragmentation by removing approximately 398 acres from core forests. Although only direct impacts to core forest were estimated, it is expected that indirect impacts would also occur. The majority of core forest impacts will occur where there are large forested tracts of land, primarily in Greene and Monroe counties. Fragmentation of roosting and foraging habitat from tree clearing within the construction limits may degrade the remaining habitat's quality by reducing the size of and distance between remaining forest tracts and thereby lowering the overall amount of roosting and foraging habitat available to a maternity colony. In some areas where forest cover is already sparse, the percentage of remaining forest may fall below the minimum amount needed to sustain a colony.

While developing the 3C working alignment, FHWA/INDOT attempted to avoid forested areas especially large contiguous tracts of forest. The FHWA/INDOT will finalize their proposed forest mitigation plans in consultation with the Service, and specific attempts will be made to improve the connectivity between forest patches in areas known to be inhabited by Indiana bat maternity colonies discovered during Tier 2 surveys.

- <u>Stream Relocation</u>
  SPRING/SUMMER/FALL
  - According to the Tier 1 DEIS, up to 40 perennial streams and 80 intermittent streams will be crossed by the 3C alignment of I-69. Stream channel relocations will destroy any existing bat flyways, roosting, and foraging areas in the sections of streams being crossed, and lower the abundance of aquatic insects that form a portion of the Indiana bat's prey base.

    FHWA/INDOT will develop site-specific mitigation and monitoring plans for stream relocations as appropriate. Proposed restoration actions will include the planting of woody and herbaceous vegetation to stabilize the banks and to provide future roosting and foraging habitat. .

- <u>Bridge Construction and Removal</u>
  SPRING/SUMMER/FALL
  - Removal of an unknown number of concrete-girder bridges from existing roadways crossed by the proposed I-69 alignment could cause <u>a loss of Indiana bat night roosts</u>. Bats would have to expend energy to seek out other night roosts that may be less suitable or otherwise limited in a bat's range.

    For bridges discovered to be night roosts during Tier 2 studies that need to be replaced, attempts will be made to replace them with bridges designed to create or recreate suitable night roosting areas.

  - Construction of bridges spanning waterways could impact water quality, stream flow, and bank vegetation. This could lead to reduced aquatic insect production and degrade the quality of riparian foraging areas.

    Impacts will be minimized by spanning as much of the floodplain as possible to preserve wildlife corridors and to minimize fill. FHWA/INDOT has committed to span the entire floodplain at the proposed crossing of the Patoka River.

- <u>Water Quality Impacts</u>
  YEAR ROUND
  - Spills of hazardous materials soil erosion could occur during construction and degrade the quality of both surface and ground water. Water quality affects the Indiana bat in terms of its aquatic insect prey, drinking water, and the environment in hibernacula. The

potential for adverse impacts may be highest within the 50 acres of sinkhole areas and sinking stream basins that would be traversed by the 3C alignment (Tier 1 DEIS, Table 6-1).

Impacts will be avoided or minimized by implementing equipment servicing and maintenance guidelines, contaminant spill, erosion-control, and herbicide use plans, following standard construction BMPs, and by installing filtering barriers in sinkhole areas (in accordance with the 1993 Karst MOU) and containment roadside ditches as appropriate.

- <u>Blasting near Known Hibernacula</u>
  FALL/WINTER/SPRING
  - Using explosives to blast through rock in karst areas can disturb or kill bats swarming, hibernating, or staging in nearby caves. Blasting too close to hibernacula may cause cave ceilings to collapse, which could directly kill hibernating bats or trap them inside. Blasting could also cause cave passages or sinkholes to become blocked, which could trap or possibly cause cave streams to backup and drown bats when present or exclude them from entering later. Blockages in a cave's passages or entries would also alter its airflow patterns and microclimates, which could make the cave unsuitable as an Indiana bat hibernaculum.

    This potential impact will be avoided or minimized by determining safe blasting charges and distances in coordination with experts on a case by case basis, by following seasonal restrictions (i.e., when bats aren't hibernating), and by monitoring and surveying known hibernacula before and after blasting occurs.

- <u>Destruction or Adverse Modification of Potential Hibernacula</u>
  FALL/WINTER/SPRING
  - Because at least 11 caves are known to be within the 2000-foot corridor of 3C and some subset of 310 historic underground mines (mostly coal mines, the majority of which have been closed and are no longer accessible to bats) documented within 5 miles of the 3C working alignment may also be within the corridor, some potential exists for Indiana bats to hibernate within these caves/mines and others not yet known (if suitable) within the proposed construction limits of I-69. Construction activities (e.g., grading, filling, and blasting) could destroy or adversely modify these caves and mines and kill any bats present and would permanently render them inaccessible or otherwise unsuitable. Because cave systems are dynamic and change over time (e.g., passages enlarge through dissolution, new cave entries form from collapsed ceilings, etc.), some of the caves that may be directly impacted by I-69 that are not currently suitable as hibernacula could become suitable in the future. So, any actions that reduce the abundance of caves or permanently preclude their future use by Indiana bats could be considered an adverse affect. It should be noted that some caves may be suitable hibernacula, but are not currently used by Indiana bats because they have been repeatedly disturbed or vandalized by humans in the past.

    Because caves are essentially a non-renewable resource, the FHWA/INDOT has shifted its working alignment to avoid direct impacts to known cave resources when possible and will continue to do so. During Tier 2, field surveys will be conducted to locate all cave entrances, sinkholes, and mines within the 2000-foot corridor. Any of these caves/mines or others deemed to be potential hibernacula that are within the WAA or within 5 miles of the 3C corridor, will be surveyed for the presence of hibernating

Indiana bats during Tier 2. Any newly discovered hibernacula will be avoided if at all possible and monitored throughout the project. Variable-width medians and/or independent alignments may be proposed to minimize direct impacts to hibernacula that can not be avoided.

FHWA and INDOT will investigate opportunities to purchase from "willing sellers", an Indiana bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and implementation of any needed management efforts, the hibernaculum(a) and associated buffer areas would be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. Uncertainty remains as to what number of (if any) private property owners with land containing an Indiana bat hibernaculum(a) within the action areas will be willing to sell.

PROJECT OPERATION

- <u>Increased Mortality from Vehicle / Bat Collisions</u>
  SPRING/SUMMER/FALL
  - Although Indiana bats have been documented safely flying over busy interstate highways (e.g., I-70 near Indianapolis; USFWS 2002), the possibility exists for individuals to be directly killed by vehicles traveling on I-69 and associated roadways (e.g., overpasses and frontage roads) once they are operational. There have been recent studies investigating Indiana bats being killed by vehicle traffic on a 2-lane road near a maternity colony in Pennsylvania (Russell et al. 2002).

    The Service anticipates that all bats that are struck by vehicles will be killed. The Service assumes that the annual number of deaths by vehicle collisions is not likely to exceed 10 Indiana bats. However, based on the best available scientific data, the actual number of Indiana bats that may be struck and killed from vehicles traveling on I-69 between Evansville and Indianapolis can not be precisely quantified during Tier 1. Therefore, this issue will be reexamined during each Tier 2 project-section consultations when more specific information will be available. For example, if a maternity colony or hibernaculum is located near I-69, additional studies may be undertaken to determine if and to what extent roadkill is occurring and FHWA/INDOT will consult with the Service to appropriately address the issue.

- <u>Increased Disturbance from Light / Noise / Vibration</u>
  YEAR ROUND
  - Increased light, traffic noise, and vibrations could cause disturbance to Indiana bats unaccustomed to these impacts while roosting, foraging, or hibernating nearby and thereby lower the suitability of adjacent habitats. Female bats in Illinois used roosts at least 1640 ft (500 m) from paved roadways (Garner and Gardener 1992). Very low bat usage close to Interstates has also been noted by other bat biologists (Whitaker, Jr. per. comm.). Conversely, some bats did use roosts near the I-70/Indianpolis Airport area, including a primary maternity roost 1970 ft (0.6 km) south of I-70. This roost was not abandoned despite constant noise from the Interstate and airport runways, however; their proximity to the Interstate could also have been due to lack of a more suitable roosting area (USFWS 2002).

No specific measures have been proposed to avoid, minimize, or mitigate these effects in Tier 1, but they may be developed in Tier 2 if evidence indicates they are warranted.

- Increased Public Awareness of Indiana Bats
  YEAR ROUND
  - Public awareness of Indiana bats, their life history requirements, and threats to the species is likely to increase as a direct result of educational pamphlets and interpretive displays that FHWA and INDOT have proposed to have designed and plan to distribute/display at public rest stops along I-69.

PROJECT MAINTENANCE

- Bridge Repair / Replacement
  SPRING/SUMMER/FALL
  - Night roosts could be destroyed, or degraded by repairs to concrete bridges or future replacement of concrete bridges with non-bat friendly designs. Bats using night roosts during maintenance projects would be forced to seek out other suitable night roosts that may be limited in number, of lower quality, or located further away.

    INDOT maintenance staff will be made Aware of any bridges used as night roosts during Tier 2 studies and subsequently monitored in an effort to reduce unnecessary disturbances.

- Water Quality Impacts
  YEAR ROUND
  - Highway project maintenance could result in a spill of hazardous materials in wetland or karst areas. Spills could degrade quality of both surface and ground waters. Water quality affects the Indiana bat in terms of its aquatic insect prey, drinking water, and the environment in hibernacula. Impacts will be reduced or avoided by conservation measures.

    Impacts will be reduced or avoided via proposed conservation measures.

INDIRECT EFFECTS

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Many of the indirect effects are beyond the authority of the FHWA or INDOT to control. Anticipated indirect effects include the following.

CONSTRUCTION, OPERATION, AND MAINTENANCE

- Habitat Loss and Degradation from Relocated and Induced Commercial and Residential Development and other associated infrastructure (e.g., new roads, fire houses, and schools) is certain to occur along the new I-69, especially near proposed interchanges. According to the Tier 1 DEIS, from 28 to 31 interchanges are likely to be constructed or modified along the I-69 alignment. Induced development is also likely to occur in areas within and surrounding the cities being served by the interstate, especially the larger ones (e.g., Bloomington, Martinsville, Washington). Likewise, I-69 has been projected to stimulate new development at the Crane Naval Surface Warfare Center. According to the Tier 1 BA, **FHWA and INDOT estimated that approximately 325 to 400 acres of forest and 10 to 30 acres of wetlands will be permanently cleared as part of development**

that the Interstate will induce over time. According to the Tier 1 DEIS, up to 458 homes and 75 businesses may have to be relocated along the 3C corridor to make way for I-69. These relocations may lead to the removal of additional amount of forest and wetland habitat.

- o Development will remove, degrade, and fragment forest serving as summer roosting and foraging and fall swarming/spring staging habitat.
- o Runoff, erosion, and improper disposal of residential trash (e.g., dumping in sinkholes) resulting from induced development could degrade water quality and cave/hibernacula environments by altering karst hydrology (e.g., plug sinkhole drains).
- o Use of pesticides, herbicides, and other chemicals at induced developments may affect bat habitat and prey base, and may bioaccumulate within the bats causing lethal or sublethal effects on individuals and reduce their reproduction.
- o Water quality in surface and cave streams could also be degraded or threatened by improper sewage treatment (e.g., septic tanks in karst areas).

See efforts mentioned under Direct Effects of habitat loss above. FHWA and INDOT have made efforts to discourage adverse impacts to forest and karst features within the WAA by eliminating or minimizing interchanges near karst habitats (e.g., no interchanges are proposed in SW Monroe County).

- Utility Right-of-Ways (ROW) will need to be relocated/realigned to accommodate construction of I-69 and may potentially need to be expanded or added to accommodate newly induced development. This is likely to result in a permanent removal of some amount of Indiana bat foraging and roosting habitat. Depending on forest age classes and canopy cover, this could be beneficial by creating some openings and edge, or detrimental by fragmenting high quality habitat. Utility ROWs may also be maintained with herbicides that are toxic to aquatic life.

- Erosion and sedimentation from disturbed soil areas where induced development is occurring can degrade water quality and cave environments, as well as plug sinkhole drainages and cause flooding in karst areas, which could drown hibernating bats.

- Road Salt and Chemical Herbicides used to maintain the Interstate and may degrade surface and ground water through runoff and degrade cave environments. Some herbicides can affect bats by accumulating in their tissues as they consume contaminated insects or drinking contaminated water.

  These impacts will be minimized by low-salt and no-spray strategies set forth in the Karst MOU (dated October 13, 1993) and the development of an Herbicide Use Plan.

- Contamination of Soil and Water from Vehicle Accidents - At some point during the operation of I-69, a vehicle accident(s) is likely to occur and result in a spill of hazardous materials into a stream, wetland or karst area. Spills could degrade quality of both surface and ground waters. Water quality affects the Indiana bat in terms of its aquatic insect prey, drinking water, and the environment in hibernacula.

  Impacts will be reduced or avoided by emergency contaminant spill plans and filtering and containment roadside ditches placed in karst areas during construction in accordance with the mult-agency Karst MOU.

- Increased Human Disturbances to Hibernating Bats is possible at unprotected hibernacula within the WAA. Increased visitation at nearby caves may result once I-69 is operational because many more people and presumably more cavers/spelunkers would be within a shorter commuting distance/time than before.

Disturbance of hibernating bats at some currently unprotected hibernacula may be completely stopped or reduced by acquiring easements from cave owners to erect bat-friendly angle-iron gates. These gates restrict access to the caves preventing disturbance of hibernacula while maintaining airflow at the entrances and allowing bats to ingress and egress. If cave owners objected to installing a gate, then other structures (e.g., perimeter fencing) or techniques (e.g., alarm systems and signs) for discouraging unauthorized visitations would be investigated. Uncertainty remains as to what number of (if any) private property owners with land containing an Indiana bat hibernaculum(a) within the action area would be willing to allow FHWA/INDOT to install a gate or other deterrent.

- <u>Increased Predation of Bats by Domestic Cats</u>. – As yet another consequence of an increase in residential developments near hibernacula within the WAA, the resident population of free-ranging domestic and feral cats is likely to increase. More cats across the landscape may lead to higher predation rates on Indiana bats, especially as they enter and exit their hibernacula. Predation of bats by at least one domestic cat (a family pet) has been reported at the entrance of a gated Indiana bat hibernaculum near the owner's home (Cave).

  This effect will be minimized by attempting to replace any poorly designed bat gates that increase the potential for predation by cats or other wild animals (e.g., Cave) and by monitoring other hibernacula where evidence suggests that predation by cats is occurring.

APPENDIX B:

EFFECTS ANALYSIS SUMMARY TABLES FOR THE INDIANA BAT PREPARED FOR THE REVISED BIOLOGICAL OPINION

Table B1. Project deconstruction, anticipated direct and indirect environmental consequences, and likely responses of exposed bats.

Project Element	Associated Direct and Indirect Environmental Consequences	Likely Responses of Exposed Bats/Colonies/Pops.	Is Take Reasonably Certain to Occur?
CONSTRUCTION			
Site Preparation: clearing, blasting, cutting, filling	Permanent direct loss of suitable roosting and foraging habitat in SAA (summer habitat	0,4,5,6,7,9,10,11,12	yes
grading, and surfacing for interstate, interchanges	Permanent direct loss of suitable roosting and foraging habitat in WAA (swarming habitat	0,4,5,6,7,8,12	yes
connector roads, frontage roads, and rest areas.	Variable loss/reduction of forested connectivity/travel corridors	0,4,5,6,7,9	yes
	Introduction of novel day/night-time construction noise,light, and dust (e.g., heavy equip. and blasting	0,1,3,4,5,6,7,9,10,11,12	yes
	Direct degradation of surface water quality (e.g., increased siltation/turbidity) in stream	0,6,7	no
	Direct loss and/or degradation of 20 acres of existing non-forested wetlands	0,5,6,7,	no
	Direct impacts or degradation of non-hibernacula, karst features and ground water resource	0,6	no
	Potential forest loss from borrow areas, rock quarries, and sand/gravel pits used for road material	0-7,9,10,11,12	yes
Demolition of existing bridges in SAA	Potential loss of roost sites beneath bridges	0,1,3,4,6	no
Construction of bat-friendly bridges in SAA	Potential net gain in day/night roost sites for bats	0,6,8,13,14	no
Revegetation of disturbed areas	Long-term protection against erosion, some insect production	0,6	no
Relocation of homes & businesses/Demo. of old	Addtnl. habitat loss/degradation and disturbances of bats during construction of new and demo. of old	0-7,9,10,11,12	yes
Relocation of utilities crossing over/under I-69	Additional habitat loss/degradation and disturbances of bats (e.g., powerlines	0-7,9,10,11,13	yes
OPERATION			
Vehicles driving on Interstate	Increased high-speed traffic through bat population centers leading to increased risk of roadkil	0,2,11,12	yes
(toll or non-toll)	Increased litter and noise/air/soil/light pollution from vehicles using I-69	0,6	no
	New and/or increased risk of accidental spills of hazardous materials occuring in action are	0,2,7,9,15	no
Stormwater diversion and retention	Degraded water quality from road runoff	0,15	no
Induced development	Degraded water quality from induced development (e.g., faulty septic systems, more NPDS dischargers	0,5,6,7,9,	no
	Habitat loss/fragmentation/degradation near hibernacula/mat.colonies from induced developmen	0-7,9,10,11,12	yes
	Induced human population growth increases risk of human visitation and vandalism at hibernacul	0,1,2,3,4,6,7,12,15	yes
High-mast lighting at interchanges and urban areas	Increased light pollution	0,5,6	no
I-69 Community Planning Grant Progam	I-69 induced growth is managed under local land-use plans designed to be protective of environmer	0-15	no
MAINTENANCE			
Annual winter applications of sal	Degradation of surface and ground water and potential reduction in aquatic insect abundance/diversit	0,5,6,7,9,	no
Annual summer mowing and herbicide use	Periodic noise, reduced vegetation and minimal reduction in insect abundance	0,1	no
Periodic resurfacing	Increased noise, night-time lighting, and dust	0,6	no
CONSERVATION MEASURES			
Purchase/protect existing forest in SAA	Permant protection of some important forest lands benefiting local maternity colonie	0,8,13,14	no
Plant and permanently protect new forest in SAA	Insures no net loss of forest habitat from direct impacts of I-69 (no mitigation of indirect impacts	0,8,13,14	no
Purchase/protect swarming habitat in WAA	Permant protection of some important forest lands benefiting local swarming/hibernating population	0,8,14	no
Plant and permanently protect new forest in WAA	Insures no net loss of forest habitat from direct impacts of I-69 (no mitigation of indirect impacts	0,8,14	no
Purchase/protection of hibernacula in WAA	Permant protection of important caves used by local hibernating population	0,8,14	no
Install gates and signs at hibernacula in WAA	Reduces risk of unauthorized visitation/disturbance/vandalism of hibernacula and hibernating bat	0,8,14	no
Conduct additional bat research and monitoring	Knowledge gained will improve current management of hibernacula and maternity habita	0,8,13,14	no
Protective fencing put beneath bridge/roost site	Reduced incidence of vandalism and human disturbance	0,8,13,14	no
Wetland mitigation and Wetland MOU	Insures no net loss of wetlands from direct impacts from I-69 (no mitigation of indirect impacts	0,8,13,14	no
Karst studies and implementation of Karst MOU	Insures protection of sensitive karst resources	0,8,13,14	no
Creation of educational materials and displays	Increased protection of Indiana bats stemming from impoved public awareness/educatio	0,8,13,14	no
GIS data made available to public and agencies	Greater awareness/protection of sensitive resources identified during I-69 planning	0,8,13,14	no

Key

0. no response
1. startled: increased respiration/heart rate
2. death/injury of adults and/or offspring
3. flees from roost during daylight / ↑predation risk
4. abandons roost site(s)
5. abandons foraging areas
6. shifts focal roosting and/or foraging areas
7. ↑ energy expenditures / ↓ fitness (short-term)
8. ↓ energy expenditures / ↑ fitness (long-term)
9. aborted pregnancy/repro. failure
10. ↑torpor, delayed development/partuition, and/or delayed sexual maturation of offspring
11. short-term ↓ colony reproductive rate (3-4 seasons)
12. short-term↓ in colony/hibernaculum size (3-4 seasons)
13. long-term ↑ colony reproductive rate
14. long-term ↑ in colony/hibernaculum size/fitness level
15. long-term↓ in colony/hibernaculum size/fitness level

n/a not applicable

Table B2. Impacts to Tree Cover in the Summer and Winter Action Areas (bold font indicates higher levels of concern).

Area Name	Existing Amount of Tree Cover[1] (acres)	Current % of Tree Cover	Direct Loss of Tree Cover (acres)	Indirect Loss of Tree Cover (acres)	Sum of I-69 related Losses to Tree Cover (acres)	% of Tree Cover after I-69	Net Loss in Existing Tree Cover caused by I-69	Estimated Cumulative Loss of Tree Cover (acres)	Total Loss of Tree Cover from I-69 and Cumulative Impacts by 2030 (acres)	Total % Tree Cover Left after I-69 and Cumulative Impacts by 2030[2]	Net Decrease in % Tree Cover by 2030
Source:	BA Add.Table 7	BAA T- 7	BAA T- 7	BAA T- 7	calculated	calculated	calculated	BAA T- 7	calculated	calculated	calculated
Pigeon Creek	1,944	**15.5%**	29	1	30	15.2%	0.2%	279	309	**13.0%**	**2.5%**
Patoka River	3,982	31.7%	19	0	19	31.5%	0.2%	24	43	31.3%	0.3%
Flat Creek	5,426	43.2%	92	2	94	42.4%	0.7%	6	100	42.4%	0.8%
East Fork	3,116	**24.8%**	50	0	50	24.4%	0.4%	5	55	24.4%	0.4%
Veale Creek	2,437	**19.4%**	20	2	22	19.2%	0.2%	6	28	**19.2%**	0.2%
West Fork (Elnora)	1,319	**10.5%**	3	1	4	10.5%	0.0%	25	29	**10.3%**	0.2%
Doans Creek	8,099	64.5%	95	3	98	63.7%	0.8%	3	101	63.6%	0.8%
Plummer Creek	8,550	68.0%	**193**	1	194	66.5%	**1.5%**	5	199	66.5%	1.6%
Indian Creek	7,549	60.1%	**359**	9	368	57.1%	**2.9%**	26	394	56.9%	3.1%
W. Fork (Bryant Creek)	4,710	37.5%	107	0	107	36.6%	0.9%	4	111	36.6%	0.9%
W. Fork (Clear Creek)	5,375	42.8%	99	0	99	42.0%	0.8%	26	125	41.8%	1.0%
W. Fork (Crooked Creek)	3,722	**29.6%**	**170**	0	170	28.3%	**1.4%**	44	214	**27.9%**	**1.7%**
W. Fork (Pleasant Run)	2,276	**18.1%**	29	4	33	17.8%	0.3%	83	116	**17.2%**	0.9%
Totals:	58,505		1,265	23	1,288			536	1,824		
Averages:	4,500.4	35.8%	97.3	1.8	99.1	35.0%	0.8%	41.2	140.3	34.7%	1.1%
Summer Action Area[4] (excluding WAA overlap)	80,866	20.5%	1,028	58	1,086	20.2%	0.3%	798	1,884	20.0%	0.5%
Winter Action Area[5]	143,948	60.2%	1,153	70	1,223	59.7%	0.5%	883	2,106	59.4%	0.9%

1. 12,566 acres in a 2.5-mile radius circle.
2. proposed forest mitigation acreages or other potential gains in forest have not been included here.
3. This relative ranking is largely based on current and predicted levels of forest habitat, connectivity of existing habitat, and proximity to rapidly developing areas.
4. A total of 394,187 acres comprise the SAA (minus the WAA overlap); numbers in this row are derived from Tier 1 and Tier 2 Forest Data (i.e., not "Tree Cover").
5. A total of 238,954 acres comprise the collective Winter Action Area; acreages for the WAA are in Tree Cover.

Table B3. Summary of impacts to Indiana bat maternity colonies (n=13) along I-69.

Colony Name	Percent of the MA* that is currently tree covered/ forested	Percent of existing tree cover that is "core forest"	Size of the biggest, connected forest patch within the MA* (acres)	In general, how well connected are all the existing forest patches in the MA?	In general, how well connected are the existing patches of Core Forest in the MA?	What is the FWS's overall perceived adequacy of this colony's current habitat?	How much tree cover will be lost to direct/ indirect/ cumulative impacts? (acres)	Will I-69 run through the center of a known or likely roosting area within the MA?	Will any of the identified roosts (n=32) be directly destroyed by I-69?	Is it likely that a primary roost tree(s) will be directly lost?	Is it likely that a primary roost tree(s) will be indirectly lost?	Is a proposed interchange within the MA? If so, is it near the center of the MA?	Once I-69 is operational, are most forested areas in the MA likely to remain for another 50 years?	Is this colony likely to persist into the reasonably foreseeable future once I-69 and forest mitigation are done?	If displaced by I-69 &/or other development, is additional maternity habitat available nearby?
Pigeon Creek	15%	7%	1,139	POOR	FAIR	FAIR	29 / 1 / 279	NO	NO	NO	NO	YES/NO	UNCERTAIN	YES	YES
Patoka River	32%	9%	3,855	GOOD	GOOD	GOOD	19 / 0 / 24	NO	NO	NO	NO	NO	YES	YES	YES
Flat Creek	43%	12%	5,385	GOOD	GOOD	GOOD	92 / 2 / 6	NO	NO	UNK.	NO	YES/NO	YES	YES	YES
East Fork	25%	2%	1,748	FAIR	POOR	FAIR	50 / 0 / 5	NO	NO	UNK.	NO	NO	YES	YES	YES
Veale Creek	19%	3%	1,423	FAIR	FAIR	FAIR	20 / 2 / 6	VERY CLOSE	NO	NO	NO	YES/NO	YES	YES	YES
West Fork (Elnora)	10%	2%	303	GOOD	FAIR	FAIR	3 / 1 / 25	NO	NO	NO	NO	YES/NO	YES	YES	YES
Doans Creek	64%	33%	8,088	GOOD	GOOD	GOOD	95 / 3 / 3	NO	NO	NO	NO	NO	YES	YES	YES
Plummer Creek	68%	34%	8,542	GOOD	GOOD	GOOD	193 / 1 / 5	NO	NO	NO	NO	NO	YES	YES	YES
Indian Creek	60%	22%	7,540	GOOD	GOOD	GOOD	359 / 9 / 26	CLOSE	NO	UNK.	NO	YES/NO	YES	YES	YES
W. Fork (Bryant Creek)	37%	18%	4,091	GOOD	GOOD	GOOD	107 / 0 / 4	NO	NO	NO	NO	YES/NO	YES	YES	YES
W. Fork (Clear Creek)	43%	18%	4,944	GOOD	GOOD	GOOD	99 / 0 / 26	YES	NO	UNK.	NO	YES/NO	YES	YES	YES
W. Fork (Crooked Creek)	30%	9%	3,046	GOOD	POOR	FAIR	170 / 0 / 44	NO	NO	NO	NO	NO	YES	YES	YES
W. Fork (Pleasant Run)	18%	2%	1,533	FAIR	POOR	FAIR	29 / 4 / 83	NO	NO	NO	NO	YES/NO	UNCERTAIN	YES	YES

* MA = maternity area

Table B4. Estimated levels of Incidental Take by stressor for Indiana bats during the Summer.

Relevant Stressors to Bats in SAA (estimated through year 2030)	Estimated Amount or Area under Stress	FEMALE AND JUVENILE BATS IN MATERNITY COLONY AREAS (160 bats/colony/year)																											MALES						
		Pigeon Creek		Patoka River		Flat Creek		East Fork		Veale Creek		W. Fork (Elnora)		Doans Creek		Plummer Creek		Indian Creek		W. Fork (Bryant Creek)		W. Fork (Clear Creek)		W. Fork (Crooked Creek)		W. Fork (Pleasant Run)		Take Subtotal	In WAA in summer		In rest of SAA		Take Subtotal	Total Take	Likely Form(s) of Take[3]
		E[1]	T[2]	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T		E	T	E	T			
I-69 Direct Impacts/Loss of Roosting Habitat (seasonal cutting restrictions observed so no direct killing anticipated)	2148 ac.	80	2	60	2	80	4	120	2	80	2	0	0	40	2	60	4	160	10	40	2	160	2	160	10	80	2	44	150	0	67	0	0	44	h
I-69 Direct Impact/Loss of Foraging Habitat/Connectivity	2148 ac.	80	2	60	2	80	1	120	2	60	2	0	0	40	0	60	1	160	4	40	0	160	1	160	2	80	0	17	150	2	67	1	3	20	h
Construction Noise/Vibrations causing bats to stress and flee roosts, ↑ risk of predation (while bats are present in adjacent areas)	-	80	1	60	1	160	2	120	2	160	3	0	0	40	1	60	1	160	2	40	0	160	1	160	2	80	1	17	150	2	67	1	3	20	H
Disturbance & Habitat Loss associated w/ Demolition and Relocation of 390 Homes & 76 Businesses (no timing restrictions)	unk.																											40					5	45	H,w,k,h
Habitat loss from I-69 related Utility Relocations (no timing restrictions/bats may be present)	unk.	80	1	80	1	80	1	80	1	80	1	0	0	80	1	80	1	80	1	80	1	80	1	80	1	80	1	12	15	1	20	1	2	14	H,w,k,h
Additional High-speed traffic / Roadkill (total roadkill/maternity colony from 2013 through 2030)	.05% risk over 17 years	160	8	160	8	160	8	160	8	160	8	0	0	160	8	160	8	160	8	160	8	160	8	160	8	160	8	96	300	20	134	10	30	126	k
I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)	23 ac. in MAs	40	1	20	0	80	1	0	0	80	1	0	0	60	1	80	1	80	3	0	0	0	0	0	0	80	2	10	18	1	8	1	2	12	H,w,k,h
Increased levels of Disturbance/Vandalism of Roosting Bats in ungated Hibernacula during the summer	unk.																											0	500	5	0	0	5	5	H, w, k
TOTAL of Direct and Indirect from I-69			15		14		17		15		17		0		13		16		28		11		13		23		14	**236**		31		14	**50**	**286**	
TOTAL Cumulative Effects (all sources through 2030)	536 ac in MAs	160	26	160	2	160	0	120	0	160	0	160	2	60	0	160	0	160	2	160	0	160	2	160	4	160	8	**46**	115	2	58	2	**4**	**50**	H,w,k,h
TOTALS Direct and Indirect + Cumulative			41		16		17		15		17		2		13		16		30		11		15		27		22	**282**		33		16	**54**	**336**	

[1] E = estimated annual # of exposed bats (for colonies the maximum number exposed = 160/year; for adult males densities were used to estimate potential exposure…with 0.13 males/impacted acre in the WAA and 0.065 males/acre in the SAA)

[2] T = maximum estimated number of exposed bats that may be taken from 2008-2030.

[3] H = harrass, w = wound, k = kill, and h = harm, which includes significant habitat modification or degradation resulting in death, or injury by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

Table B5. Estimated levels of Incidental Take by stressor for Indiana bats during spring, fall, and winter.

Project Phase	Relevant Stressors to Bats in WAA (estimated through year 2030)	Estimated Amount or Area of Stressor	HIBERNACULA* in WAA: Buckner E[1]	Buckner T[2]	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	[redacted] E	T	Total Take of Bats†	Likely Form(s) of Take[3]
	I-69 Direct Impacts/Loss of <u>Roosting</u> Habitat (seasonal cutting restrictions observed so no direct killing anticipated)	1153 ac.	12	0	9,270	5	9,875	5	196	0	109	1	88	1	95	2	25	0	17	0	1	0	28	0	54,325	0	14	h
	I-69 Direct Impact/Loss of <u>Foraging</u> Habitat/<u>Connectivity</u>	1153 ac.	12	0	9,270	0	9,875	0	196	0	109		88		95		25		17	0	1	0	28	0	54,325	0	0	h
	Construction <u>Noise</u>/Vibrations causing bats to stress and flee roosts, ↑ risk of predation (while bats are present in adjacent areas)	1153 ac.	12	0	9,270	0	9,875	0	196	0	109		88		95		25		17	0	1	0	28	0	54,325	0	0	H
	Disturbance & Habitat Loss from Demo. & Relocation of 390 Homes & 76 Businesses	unk.																									15	H,w,k,h
	Habitat loss from I-69 related Utility Relocations (no restrictions/bats present)	unk.	12	0	9,270	0	9,875	0	196	0	109	0	88	0	95	0	25	0	17	0	1	0	28	0	54,325	0	0	H,w,k,h
	Additional High-speed traffic / Roadkill (total from 2013 through 2030)	.0025% risk over 17 years	12	0	9,270	23	9,875	25	196	1	109	0	88	0	95	0	25	0	17	0	1	0	28	0	54,325	136	185	k
	I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)	70 ac.	12	0	9,270	0	9,875	0	196	0	109		88		95		25		17	0	1	0	28	0	54,325	1	1	H,w,k,h
	Increased risk levels of Winter Disturbance/Vandalism of Hibernating Bats in vulnerable Hibernacula[4]	1% increase in risk	12	1	9,270	93	9,875	0	196	2	109	1	88	1	95	1	25	0	17	0	1	0	28	0	54,325	543	642	H, w, k
	TOTAL of Direct and Indirect from I-69			1		121		30		3		2		2		3		0		0		0		0		680	**857**	
	Cumulative Effects of Winter Disturbance/Vandalism of Hibernating Bats in vulnerable Hibernacula	1% over the span of 20+ years	12	1	9,270	93	9,875	0	196	2	109	1	88	1	95	1	25	0	17	0	1	0	28	0	54,325	543	642	H, w, k
	Cumulative Effects of ongoing Roadkill (total roadkill/hibernating pop. from 2013 through 2030)	.0025% risk over 17 years	12	0	9,270	23	9,875	25	196	1	109	0	88	0	95	0	25	0	17	0	1	0	28	0	54,325	136	185	H, w, k
	Cumulative Effects of Forest Habitat Loss/Degradation, surrounding Hibernacula associated (through 2030)	883 ac.	12	1	9,270	5	9,875	10	196	15	109	15	88	12	95	15	25	1	17	5	1	1	28	1	54,325	10	91	H,w,k,h
	TOTAL of Cumulative			2		121		35		18		16		13		16		1		5		1		1		689	**918**	
	TOTALS Direct and Indirect + Cumulative			3		242		65		21		18		15		19		1		5		1		1		1,369	**1,775**	

* [redacted] and [redacted] caves were not included as they currently do not contain winter populations. Similarly, [redacted] Cave was not included as it was not analyzed in the BA Addendum since it was recently found and only contained 1 Indiana bat.

† We are assuming that half of the take would involve adult males and half adult females (i.e., 50:50 sex ratio and no sexual bias in probability of occurrence).

1 E = estimated annual # of exposed bats (used winter 2005 population numbers for each hibernaculum)

2 T = maximum estimated number of exposed bats that may be taken from 2008-2030.

3 H = harrass, w = wound, k = kill, and h = harm, which includes significant habitat modification or degradation resulting in death, or injury by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

4 Assumes worst-case scenario that cave owners will not allow their vulnerable caves to be gated.

United States Department of the Interior
Fish and Wildlife Service

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May 31, 2011

Robert F. Tally, Jr.
Division Administrator, Indiana Division
U.S. Department of Transportation
Federal Highway Administration
575 North Pennsylvania Street, Room 254
Indianapolis, Indiana 46204

Dear Mr. Tally:

Pursuant to your April 11, 2011 request for reinitiation of eonsultation for the eonstruction, operation, and maintenance of Alternative 3C of Interstate 69 from Indianapolis to Evansville, Indiana and its effects on the Federally endangered Indiana bat (*Myotis sodalis*), the U.S. Fish and Wildlife Serviee is providing the enclosed amendment to the Tier 1 Revised Programmatie Biological Opinion (RPBO) and Incidental Take Statement (ITS) (dated August 24, 2006). The decision to amend the current Tier 1 opinion is primarily based on the discovery of the disease White Nose Syndrome within the state of Indiana, including part of the aetion area, which falls within the Indiana bat Midwest Recovery Unit. In addition, a new Indiana bat maternity colony was recently discovered within the right of way of Section 4 of the project which stretches from just east of the existing US 231 intersection with SR 45/SR 58 in Greene County to SR 37 near Victor Pike in Monroe County. Other new information evaluated in the following amendment includes minor forest impacts within the Winter Use Area (*i.e.* swarming habitat); is designated Critical Habitat for the Indiana bat. Overall, the amount of project impacts has decreased since the Tier 1 analysis was completed and no additional habitat impacts are anticipated. For the situation involving only the location of the habitat impacts has changed (now within the 5-mile Winter Use Area for the cave), not the amount. In light of the new information, the FWS felt it was warranted to reevaluate the impacts to the species and update the 2006 Tier 1 RPBO and ITS.

The attached document amends the U.S. Fish and Wildlife Service's Tier 1 Revised Programmatic Biological Opinion (August 24, 2006). The comments and discussion provided in the amendment address each of those sections of the 2006 Tier 1 RPBO biological opinion which required new analysis for effects to the Indiana bat; otherwise, the Tier 1 RPBO is still a valid document. No new analysis was conducted for the bald eagle (*Haliaeetus leucocephalus*) or fanshell mussel (*Cyprogenia stegaria*) and our previous opinions remain unchanged; however, since the process for the tiered approach has changed slightly since the 2006 Tier 1 RPBO was issued (*i.e.* individual, stand-alone Tier 2 BOs are now being issued instead of "appended" to the Tier 1 RPBO), the ITS language relevant to the tiered consultation approach for the bald eagle has been updated and is ineluded in this amendment.

We look forward to continued cooperation with your agency to conserve our Nation's threatened and endangered species. If you have any questions, please contact Robin McWilliams Munson of my staff at 812-334-4261 x. 207.

Sincerely,

Scott E. Pruitt
Field Supervisor

Cc: Tom Cervone, BLA, 6200 Vogel Road, Evansville, IN 47715
Michelle Allen, FHWA, 575 N. Pennsylvania St., RM. 254, Indianapolis, IN 46204
Laura Hilden, INDOT, Indianapolis, IN

Amendment to the Tier 1 Revised Programmatic Biological Opinion (dated August 24, 2006) for the I-69, Evansville to Indianapolis, Indiana highway.
May 25, 2011

This document has been prepared for the I-69 Evansville to Indianapolis Project. The Federal Highway Administration (FHWA) has used a tiered environmental review process for this project. The U.S. Fish and Wildlife Service (USFWS) issued a Tier 1 BO in December of 2003, and shortly afterward FHWA issued the Tier 1 Final Environmental Impact Statement (FEIS). FHWA issued a Tier 1 Record of Decision (ROD) on March 24, 2004, and then initiated Tier 2 EISs for each of the six sections of the approved corridor (known as I-69 Sections 1 through 6).

The USFWS issued a Revised Tier 1 BO in August of 2006 for the entire corridor. The Revised Tier 1 BO requires a separate BO for each of the six sections of the project. Tier 2 BOs have been issued for Section 1 (August 29, 2007), Section 2 (February 17, 2010), and Section 3 (October 21, 2009). INDOT submitted a Tier 2 BA on November 1, 2010 for Section 4 of the Project. Consultation on the entire corridor was reinitiated in 2011, for the reasons discussed below. USFWS has prepared this Amendment to the August 2006 Revised Tier 1 BO.

New Information/Need for Reinitiation

During hibernacula surveys this past winter (2010-2011), the disease White Nose Syndrome (WNS) was found within several Indiana caves, including some of those that serve as Indiana bat hibernacula. This is the first time the disease has been documented in Indiana. Currently, no Indiana bats in Indiana have been confirmed with WNS. Several species, including little brown bats (*Myotis lucifugus*), have been found with fungal growth on the muzzle and other parts of the body; mortality attributed to WNS has been documented in little brown bats (*Myotis lucifugus*), tri-colored bats (*Pipistrellus subflavus*), and northern long-eared bats (*Myotis septentrionalis*) at one hibernacula this season in Indiana (R. Geboy, FWS, pers. comm.). The most recent distribution of suspected and confirmed locations for the disease is shown below in Figure 1.

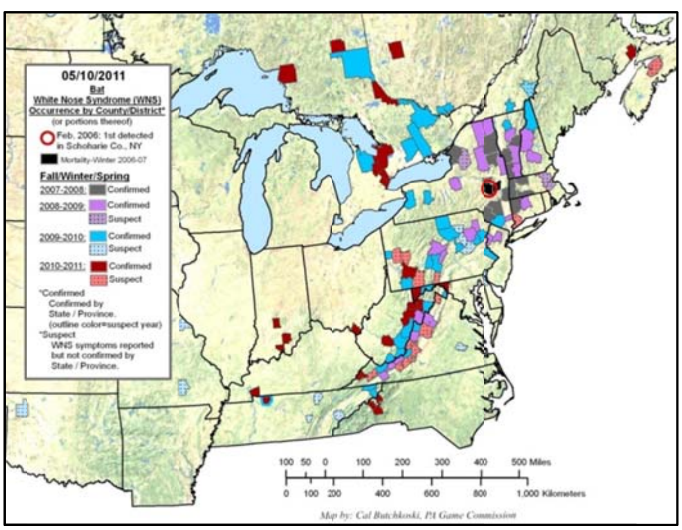

Figure 1.White Nose Syndrome Occurrence by County/District, Updated 05/10/2011.

In addition to new disease information, pre-construction mist netting was conducted this past summer (August 2010) as required by Conservation Measure D.5 in the Tier 1 Revised BO.

During the survey, a male Indiana bat was captured in I-69 Section 4 at Site 14 and a radio-transmitter was secured to it following U.S. Fish and Wildlife Service (USFWS) protocol. (A male Indiana bat was found at this same site in 2004 although was not radio-tagged). This male was tracked for seven days, during which time investigators tracked it to three different live shagbark hickory roosts (adjacent to but out of the Section 4 right-of-way) and one dead sugar maple snag within the right-of-way. During five nights of exit-count surveys the number of bats seen leaving the dead snag was: 34, 34, 32, 27, and 30. According to the criteria established in the Tier 1 RPBO, a maternity colony is determined to exist if there is evidence of reproduction in an area including the capture of a reproductive female or juvenile, or high emergence counts at an identified roost tree. Other factors considered in determining whether this colony was a new Indiana bat maternity colony included the proximity to other known colonies, availability of potential roost trees, and genetic analysis. The closest known maternity colonies are over 2.5 miles from this new colony's primary roost tree. The Plummer Creek colony is approximately 2.6 miles west and the Indian Creek colony is approximately 4.6 miles northeast.

Over 60% of the Action Area in Section 4 is forested, and according to forest transect survey data, is estimated to contain approximately two snags per acre. Considering the location of the roost, the number of bats using it, and the rural, forested nature of this part of the project area, it is not surprising this area supports more than the three maternity colonies originally discovered. An attempt to determine the sex of the bats roosting in the newly identified primary roost tree by DNA analysis of guano collected at the site was unsuccessful; however, it is improbable that a colony of that size (based on exit counts) was comprised of only male bats. Based on the discovery of this primary roost tree, the FWS has determined that four maternity colonies are present within Section 4: Doan's Creek, Plummer Creek, Little Clifty Branch (new), and Indian Creek. This brings the total number of known Indiana bat maternity colonies to 14 project-wide and will result in a slight increase in the estimated number of bats impacted by the project.

Finally, some minor forest impacts within 5 miles of Cave have recently been identified. Cave is designated as Critical Habitat for the Indiana bat under the Endangered Species Act. At the time Cave was designated as Critical Habitat (September 24, 1976), the federal rule did not identify constituent elements associated with the conservation value of this particular cave, nor did it for any of the other caves or mines that were designated at that time. Therefore, in the Tier 1 RPBO, the Bloomington, Indiana Field Office (BFO) identified the physical and biological features that make Cave essential to the conservation of Indiana bats. We believe the important conservation features include the cave's physical structure, configuration, and all openings that create and regulate suitable microclimates for hibernating bats within, its associated karst hydrology and cave stream recharge area/watershed, and the amount and condition of surrounding forested habitat (specifically all forest extending 5 miles from the cave's entrances) that is used by the bats during the pre-hibernation swarming period each fall. To avoid confusion with the use of the term "Action Area", this 5-mile area surrounding Cave is now referred to as its Winter Use Area (WUA) instead of Winter Action Area (WAA), as was previously used.

During the Tier 1 analysis it was determined that no direct impacts to Cave itself or any of its important conservation features (as identified by our office) would occur based on the then preferred alternative. At that time, a more northern connector road was the preferred alternative, and was located just outside of the Cave WUA. This led, in part, to a "not likely to adversely affect" determination for the Cave Critical Habitat. Since that time, a southern connector road has been identified as the preferred alternative. This new alignment will have approximately 26 acres of right-of-way that falls within the 5-mile radius of swarming habitat surrounding Cave, and will result in approximately 16.2 acres of direct tree cover loss (11.8 acres of upland forest loss). The nearest forest impact will occur approximately 4.5 miles from the cave's main entrance. The Cave WUA contains 32,607 acres of tree cover. Therefore, a loss of 16.2 acres of tree cover represents about 0.05% of the existing available habitat. The selection of the southern connector option does not change the other factors considered in the Tier 1 evaluation including the amount of indirect or induced impacts anticipated within the Cave WUA and the overall potential for increased vandalism of the cave. In order to account for some minor Tier 2 alignment adjustments, a 10% overage allowance for forested acreage impacts was established in the Tier 1 consultation. Because there were originally no impacts to the important conservation features of the Cave WUA, the 10% allowance for the Cave WUA has been exceeded and the new impacts are being evaluated during this reinitiation process.

Status of the Species

Rangewide Update

Since the completion of the Tier 1 RPBO in 2006, new species information and population data are available. Although this type of information continues to be updated via the Tier 2 consultation process for each project section, following is a brief summary of the most recent information available and the current status of the species.

On 15 April 2007, the Service released the *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision* (USFWS 2007), which contains an excellent summary of the current status of the Indiana bat. In addition, the Bloomington Field Office (BFO) recently completed a 5-Year Review of the Indiana bat (USFWS 2009), which summarizes the current status of the species, progress towards recovery, and remaining threats to the bat. Both the draft recovery plan and 5-Year Review are available on the Service's Indiana bat website at http://www.fws.gov/midwest/Endangered/mammals/inba/index.html and are hereby incorporated by reference. The 5-Year Review found that the required recovery criteria for the Indiana bat had not been achieved and thus it should remain at its current 'endangered' status. The Recovery Priority Number for the Indiana bat was changed from "8" to "5", reflecting a species that currently faces a high degree of threat and has a low recovery potential.

Since the April 2007 release of the Draft Recovery Plan (and the 2006 Tier 1 RPBO), the USFWS BFO has collated the population data gathered during the 2007 and 2009 biennial winter hibernacula surveys throughout the range. Based on these surveys, it was determined that the Indiana bat's 2009 range-wide population stands at approximately 414,031 bats, which is a decrease over the 2007 range-wide population estimate of 469,489 bats (USFWS, unpublished data, 2011; see Figure 2). It is important to note that Indiana's population estimate was recently revised for 2009 based upon newly obtained photo-analysis results at five of the major hibernacula in the state. This new analysis method added approximately 25,000 bats to the original 2009 estimate. Prior to 2007-2009, the range-wide, biennial population estimates had been increasing since at least 2001, indicating that the species' long-term decline had been, at least temporarily, arrested and likely reversed (USFWS, unpublished data, 2010). The observed range-wide decline in 2009 is partly attributable to the recently described disease dubbed White-Nose Syndrome (see discussion below), especially for decreased population estimates in the Northeast; however, some unexplained population declines have also occurred at some key hibernacula in Indiana and Kentucky as well. Just over half of the 2009 range-wide population hibernated in caves within the bat's namesake state of Indiana. The species' range-wide, regional, state, and hibernacula-specific population trends are being closely monitored by the BFO.

Given the 2009 range-wide Indiana bat population estimate of approximately 414,031, we assume that there are approximately 2,588 to 3,450 maternity colonies throughout the species' entire range [assuming a 50:50 sex ratio (Humphrey et al. 1977) and an average maternity colony size of 60 to 80 adult females (Whitaker and Brack 2002)]. At present, the Service has location records for approximately 269 maternity colonies (USFWS 2007), which, based on the assumptions above, represents 8 to 11% of the assumed number of maternity colonies in existence.

Recovery Efforts

Since the Indiana bat's initial listing, the recovery program has largely been focused on protection of important hibernacula (USFWS 1983). The proposed recovery program outlined in the draft Recovery Plan (USFWS 2007) has four broad components: 1) range-wide population monitoring at the hibernacula with improvements in survey techniques; 2) conservation and

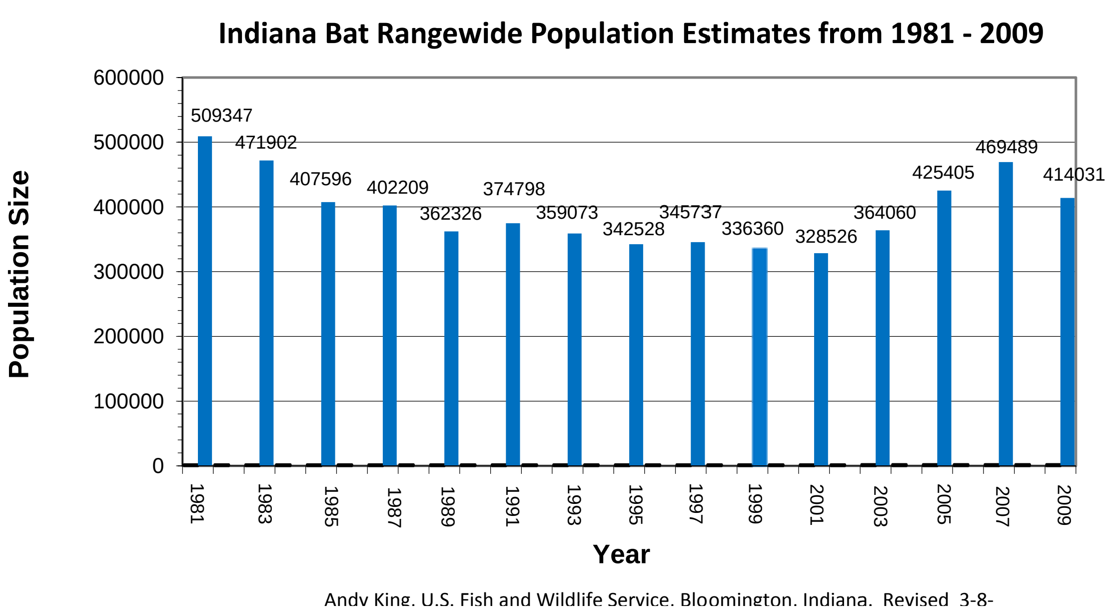

Figure 2. Indiana Bat Rangewide Population Estimates, Revised 2011.

management of habitat (hibernacula, swarming, and summer); 3) further research into the requirements of and threats to the species; and 4) public education and outreach. This recovery program continues to have a primary focus on protection of hibernacula but also increases the focus on summer habitat and proposes the use of Recovery Units to establish and focus recovery efforts.

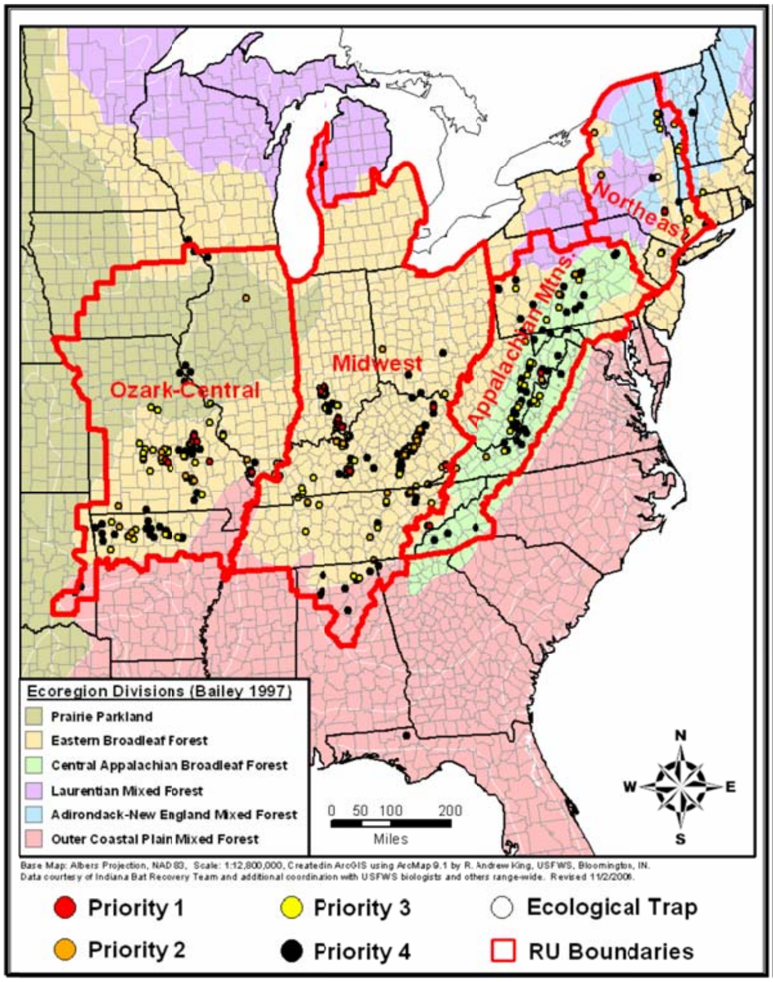

Figure 3. Proposed Indiana bat Recovery Units (Service 2007).

Recovery Units

The Service's proposed delineation of Recovery Units (RUs) relied on a combination of preliminary evidence of population discreteness and genetic differentiation, differences in population trends, and broad-level differences in macro-habitats and land use (USFWS 2007). The Indiana Bat Draft Recovery Plan proposes four RUs for the species: Ozark-Central, Midwest, Appalachian Mountains, and Northeast (USFWS 2007) (Figure3). The proposed project lies entirely within the Midwest RU. The 2009 Indiana bat population estimate for the Midwest Recovery Unit stands at 284,016. Although this is a decrease from 2007 (320,300), over the last 10 years the Midwest Recovery Unit has seen an overall increase in the Indiana bat population.

Indiana Bat Status in Indiana

Historic hibernating population levels in Indiana were comprehensive enough to estimate on a statewide level for the first time in 1981, resulting in an estimate of 151,676 hibernating bats (USFWS, unpublished data, 2010). Since that time, the statewide estimate fell to a low of 104,680 bats in 1985 and then rose steadily until the 2007 survey when it reached 238,009 bats. In 2009, the state-wide population was estimated to be approximately 215,277 bats, which is a decrease based on 2007. In 2009, Indiana's 37 hibernacula harbored approximately 52% of the range-wide population of Indiana bats and approximately 76% of the Midwest Recovery Unit population. The State's (and the world's) two most populous Indiana bat hibernacula are Cave (n=59,250 bats in 2009) and Cave (n=52,610 bats in 2009), which are located approximately 5 miles and 70 miles from the I-69 project corridor, respectively. The status of Indiana bats in Indiana greatly influences the status of the species within the Midwest RU and rangewide.

New Threats: WNS and Wind Turbines

Recently a new threat has emerged with serious implications for the well-being of North American bats, including the Indiana bat. White-Nose Syndrome was first documented in a photograph taken in a New York cave in February 2006. Since that time, over 160 sites in 17 states (New York, Massachusetts, Vermont, New Hampshire, Connecticut, Virginia, West Virginia, Pennsylvania, New Jersey, Maryland, Missouri, Oklahoma, Tennessee, North Carolina, Indiana, Ohio, and Kentucky) and three Canadian provinces (Ontario, Quebec, and New Brunswick) have been documented with WNS, including over 50 known Indiana bat hibernacula. In some affected hibernacula in New York and New England, 90 to 100 percent of the bats have died. Some scientists estimate that WNS has killed more than a million hibernating bats (BCI 2010). The Northeast Recovery Unit population of Indiana bats has suffered an approximate 60% decline (loss of at least 32,292 bats, primarily in New York) between 2007 and 2010 (USFWS unpublished data 2011) much of which is attributed to WNS.

WNS has been characterized as a condition primarily affecting hibernating bats. Affected bats usually exhibit a white fungus on their muzzles and often on their wings and ears as well (Blehert *et. al.* 2009). Some affected bats may display abnormal behavior including flying during the day and in cold weather (before insects are available for foraging) and roosting towards a cave's entrance where temperatures are much colder and less stable. Many of the affected bats appear to have little-to-no remaining fat reserves which are necessary to survive until spring emergence. Recently the fungus associated with WNS has been identified as a previously undescribed species of the genus *Geomyces* (named *G. destructans*; G.d.) (Gargas *et. al*., 2009). The fungus thrives in the cold and humid conditions of bat hibernacula. It is unclear at this point if the fungus is causing the bat deaths directly, or if it is secondary to the cause of death. All of the possible modes of transmission are not currently known, although biologists suspect it is primarily spread by bat-to-bat contact. In addition, people may unknowingly contribute to the spread of WNS by visiting affected caves and subsequently transporting fungal spores to unaffected caves via their clothing and gear. Interestingly, G.d. has been documented growing on hibernating bats in several European countries, but the fungus does not appear to be causing widespread mortality there (Puechmaille *et al.* 2010). Within the U.S., WNS has been confirmed in the Indiana bat, little brown bat, small-footed bat, northern long-eared bat, southeastern bat, tricolored bat and big brown bat. The *G. destructans* fungus has also been detected on two additional bat species: gray bats and cave myotis.

Despite all of the unanswered questions about WNS, there are now four years of population monitoring data which provide valuable insights into the effects of WNS. Considering WNS has been affecting hibernating bat populations for the longest in New York (since February 2006), data from that State may provide the best indication of the effects of this disease on bats, including Indiana bats. By 2009, all known Indiana bat hibernacula in New York, except for a recently-discovered site (P3 or P4) in Orange County (Mine), had been documented with WNS. However, the apparent effects of WNS on Indiana bats varied between affected hibernacula. Some Indiana bat hibernating populations have declined by 92 to 100% (Hicks *et al*. 2008), while counts of Indiana bats at other WNS-affected New York hibernacula (*e.g.*, and Mine) have remained somewhat steady (USFWS unpublished data, 2011).

Biologists with New York State Department of Environmental Conservation conducted photographic surveys of all New York Indiana bat hibernacula in March 2008, to compare with the 2006-2007 counts. There were some notable differences in the population trends between affected sites. For example, Indiana bat numbers and roosting locations appeared normal at both and in 2008 (Service unpublished data). However, at Cave, the "K-cluster" of Indiana bats appeared to be where expected at the end of March 2008, but preliminary analyses indicate that there were approximately 600-800 fewer individuals that season compared to the 2006-2007 count of 1,932 Indiana bats (a decrease of 30-40%). Preliminary 2008-2009 winter counts were back up to 1,719 Indiana bats, although in 2010, survey results indicate the colony was down to only 509 bats, an approximate 74% decrease from 2007. Recent numbers for this colony in 2011 were approximately 430.

Another significant decline (100%) was observed at Cave, where Indiana bats had been documented during every survey since 1981. In 2004-2005, 685 Indiana bats were observed at the site, but no Indiana bats (living or dead) were found at Cave during surveys in 2007, 2008, or 2009 (Hicks and Newman 2007, A. Hicks, NYSDEC, pers. comm.). Cave has been classified as an ecological trap hibernaculum in the Indiana Bat Draft Recovery Plan (USFWS 2007) due to the history of occasional flooding and freezing events at this site; however, the total and persistent loss of all Indiana bats at this site is unprecedented.

The 2007-2008 counts at the and hibernacula were down by 92-99% when compared to 2006-2007 mid-winter surveys. In 2006-2007, there were approximately 13,014 and 1,003 Indiana bats in the and hibernacula, respectively. In April 2008, counts were closer to 124 and 80 Indiana bats, respectively (Hicks *et al*. 2008). Count data collected during the February 2009 survey found 341 and 32 Indiana bats at the and hibernacula, respectively. In 2010, preliminary counts at found 190 bats and 26 bats at for overall declines of approximately 97% to 98% since 2006-2007. which is in the same complex of hibernacula, had declined by only 29% (24,307 to 17,255) from 2007 to

2009; however, preliminary survey data in 2010 found only 8,152 bats hibernating at the site, a decline of almost 64% from 2007 (USFWS unpublished data). One deviation from the post-WNS population trend data from New York is the Mine site. The population at this WNS-affected site has remained stable, and actually slightly increased from 9,393 bats in 2007 to 10,678 bats in 2010, despite being positive for G.d. (USFWS unpublished data, 2011).

Up until recently, WNS has primarily been documented within the Northeast and Appalachian Mountain Recovery Units (RUs) (Figure 2). However, in the winter of 2009-2010, *G. destructans* was detected on bats in Missouri, which is in the Ozark-Central RU, and WNS was confirmed in three caves in central Tennessee, which falls within the Midwest RU. In addition, one site has recently been confirmed with WNS in both Ohio and Kentucky, and at least three sites, including three separate species, have been confirmed with WNS in Indiana (USFWS 2011). The Midwest RU covers the states of Indiana, Kentucky, Ohio and portions of Alabama, Georgia, Michigan and Tennessee (Figure 2). To date, WNS has not been found in Alabama or Michigan. There are many factors regarding WNS that remain unknown including if there are species' and/or regional differences in susceptibility and mortality rates, how long symptoms may take to manifest, and the long-term population effects. Meanwhile, the Service, States and multiple researchers are continuing to learn more about the disease and options for minimizing its spread and impacts. To date, no WNS-related mortality has been documented in the Ozark RU and no mortality to Indiana bats has been found in the Midwest RU; however, based on the pattern seen in the northeast and Appalachians, we believe the disease will continue to spread throughout these regions within the next several winters, with some level of mortality likely to occur. For more information on WNS see http://www.fws.gov/WhiteNoseSyndrome/.

Lastly, there is growing concern that Indiana bats (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Until the fall of 2009, no known mortality of an Indiana bat had been associated with the operation of a wind turbine/farm. The first documented wind-turbine mortality event occurred during the fall migration period in 2009 at a wind farm in Benton County, Indiana. The Service is now working with wind farm operators to avoid and minimize incidental take of bats and assess the magnitude of the threat. There are no known wind farms within the I-69 project area. For more information see http://www.fws.gov/midwest/News/release.cfm?rid=177.

Action Area

The proposed project involves the construction, operation, and maintenance of an Interstate highway, I-69, from Indianapolis to Evansville, through southwestern Indiana. The "Action Area" is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. For Tier 1, the FHWA, INDOT, and the Service's BFO agreed to break the Action Area down into two seasonally based "sub-" action areas for the purpose of analyzing impacts to the Indiana bat. These areas include a summer impact area, referred to as the Summer Action Area, and a winter impact area, referred to as the Winter Action Area. The Tier 1 RPBO (pg. 32) specifically defines these areas and is hereby incorporated by reference. These two impact areas combined comprise the project's Action Area.

Environmental Baseline

Status of the Species in the Action Area

Maternity Colonies

As discussed above, a new maternity colony was discovered during pre-construction surveys in Section 4 in 2010. A male Indiana bat was captured and radio-tagged in early August, and was found to be roosting with 27 to 34 other bats on at least five separate days. The bats were roosting in a dead sugar maple over 2.5 miles from any previously identified maternity colony. Since the Tier 1 RPBO was completed, additional limited bat surveys have been conducted in several of the project sections. One year of both pre- and post-construction surveys has been conducted in Section 1, and one year of pre-construction surveys has been conducted in Sections 2, 3, and the southern portion of 4. In 2009, three reproductive adult female Indiana bats were captured in Section 1, and in 2010, one adult male was found. Also in 2010, five adult females were found in Section 2, one adult female in Section 3, and one male in Section 4. Some additional roost trees have been identified, including a new primary roost in Section 4 and a secondary roost in Section 2. A few of the roost trees initially identified are no longer standing, including two secondary roosts within the Veale Creek maternity area. One tree in the Plummer Creek colony area and one in the Doan's Creek area were recently described as being deteriorated (although they were still standing). Finally, the newly identified primary roost in the Little Clifty Branch maternity colony area was found on the ground in late November of this year. It is unclear how the tree was felled, but no bats were thought to be present at that time of year. The above discoveries bring the total number of maternity colonies within the Summer Action Area to 14.

Hibernacula Populations and Adult Males

During the Tier 1 evaluation, the most recent population estimates were derived from the 2005 winter hibernacula surveys. Currently, the most up-to-date population information is from the 2009 surveys. In 2005, the estimated number of Indiana bats in all the hibernacula within the Action Area was 74,042. In 2009, the estimate was 97,688 bats. Table 1 lists the updated population for each hibernaculum within the I-69 Action Area based on 2009 data where available. In order to estimate the density of male bats within the Action Area during the summer months, we assumed half of the bats using the hibernacula within the Action Area were male and that half of those male bats would remain close to their hibernacula during the summer; the other half of the male bats would disperse, presumably to other areas within the Action Area (See footnote in Table B4 in Appendix A).

Table 1: Updated Indiana bat Populations within Hibernacula in Action Area

Hibernacula	2009 Indiana bat Population
Cave	59,250 (-18,437 from 2007))
Cave	18,640 (+4,541 from 2007)
Cave	19,197 (+6,390 from 2007)
Cave	0 (-3 from 2005)
	218 (0 from 2007)
Cave	61 (-29 from 2007)
	48 (-35 from 2007)
	188 (+106 from 2007)
Cave	10 (-39 from 2007)
	9* (-16 from 2005)
	48 (+20 from 2005)
Cave	17** (-17 from 2003)
Cave	0** (0 from 2003)
	1 (only surveyed in 2006)
Cave	1**

*Last survey completed in 2007

** Last survey completed in 2005

Note: An independent study of Cave in March 2010 showed approximately 40 Indiana bats.

Ongoing Stressors in the Action Area

A detailed discussion of ongoing stressors affecting the Indiana bat within the Action Area is found in the Tier 1 RPBO on pages 75 and 79. The discussion is broken down by Summer and Winter Action Areas and is hereby incorporated by reference. In addition to the previously discussed stressors, the disease WNS has now been found within two of the Priority 1A hibernacula within the Action Area (R. Geboy, USFWS, pers. comm.). Mortality of Indiana bats due to WNS has not been documented within the Action Area, although mortality of other species has been found.

Effects of the Action

Although the project activities and footprint are essentially unchanged (with the exception of the south connector road), based on the new number of colonies and revised hibernacula and male bat density estimates, we have determined that a larger number of Indiana bats may now be exposed to those impacts and therefore the project may result in an increase in the projected number of Indiana bats affected through the year 2030 (see Table B4 in Appendix A). More importantly, the recent discovery of WNS in Indiana warrants an additional analysis regarding the degree (based on the potential for significant population declines in the Midwest RU) the current activities may affect the species' ability to persist and recover at the local level (primarily the maternity colony level), in the Midwest Recovery Unit, and rangewide.

Survival and Recovery of Maternity Colony Units

Based on our assumptions as described in the Tier 1 RPBO, each maternity colony is comprised of 80 adult females and their single offspring. This results in a maximum of 160 bats per colony by mid-June after the young are born and become volant (i.e., capable of flight) around mid-July. Therefore, given the documented presence of 14 maternity colonies in the Action Area (which includes the new Little Clifty Branch colony) and an approximate total of 160 females and their pups per colony, we can assume that there are a combined total of approximately 2,240 (14 x 160 = 2,240) adult females (n=1,120) and juveniles (n=1,120) within or adjacent to the Action Area during the summer active period and that varying proportions of the bats in these colonies are likely to be exposed to direct and/or indirect effects from I-69.

Estimates of the number of bats exposed and adversely affected (i.e. disturbed, injured, or killed, henceforth referred to as take) during the summer maternity season as a result of the various project stressors are shown in Appendix A, Table B4. These numbers have been recently updated to reflect the newly identified maternity colony. The impact this anticipated take will have in light of the presence of WNS is discussed below.

As previously mentioned, until just recently, the Indiana bat population numbers in Indiana over the past 20 years indicate an increasing trend, particularly for the larger, Priority 1A hibernacula within the project area. This hibernating population appears to be an important source population for maternity colonies in the central portion of the state, including portions of the Action Area (USFWS unpublished data, 2011). From 1997 to 2009, the Indiana bat hibernating population at the three Priority 1A sites in the project area increased from 58,587 to 97,087 bats. A population increase of this magnitude cannot be from increased survivorship or reproduction rates alone; immigration from other hibernacula must have also occurred. Bats that migrate to high-quality summer habitat close to their hibernacula are exposed to less migration stress and mortality risk than long-distance migrants would be exposed to, and this probably contributes to higher survival and reproductive rates. In addition, because Indiana is at the core of the Indiana bat's range, it is logical to assume that factors necessary for the survival and success of the species, both in summer and winter, are optimal here, compared to other recovery units.

The impact WNS may have on the ability of the Indiana bat to persist and recover is presently unknown. We currently do not have estimates of adult survivorship, juvenile survivorship, or fecundity for Indiana bat populations affected by WNS. Based on a small amount of New York survey data from 2007 to 2010, Indiana bat hibernating populations in New York appear to have declined by 61% overall with affected individual hibernacula having population growth rates ranging from –99% to 14% during this time period. To determine the effects of the proposed project on the Indiana bats in the Action Area in light of WNS, we used a reasonable worst-case scenario of a 60% decline in the estimated maternity colony populations in the Action Area over the next three years. Using our previous assumption that a maternity colony consists of on average 80 adult females and their single offspring, a 60% decline would reduce the maternity colony to 32 adult females by the end of three years. Based on the range of known sizes of maternity colonies, a colony of 32 adult individuals would still be considered a viable colony. Direct and indirect project-related maternity colony impacts, as currently estimated, are roughly 1 bat per colony/per year, estimated through the year 2030. Although final survey results in Indiana are not yet in for 2011, preliminary information suggests that there have not been any significant population shifts or declines in the numbers of Indiana bats at hibernacula visited this year and no evidence of WNS in the largest hibernacula within the Action Area. In fact, and Caves both show an increase in their Indiana bat populations from 2009 to 2011 (A. King, USFWS, pers. comm.).

Most project impacts to the maternity colonies will be as a result of direct loss of roosting and/or foraging habitat, and impacts from construction noise and/or vibrations. These impacts will be temporary in nature and occur at different times over a period of years. Almost all direct impacts related to tree clearing and its associated construction noise in Sections 1-3 have already occurred. These impacts (namely forest loss) will most likely be realized by the maternity colonies in these sections this upcoming maternity season, presumably before any significant impacts from WNS occur in Indiana. (Pre- and post-construction monitoring is being conducted in all sections to help evaluate the on-going status of the maternity colonies in the Action Area.) Similarly, we anticipate many of the project impacts in Sections 1,2,3 and 4 to occur prior to the full onset of WNS (if the spread and the effects of the disease follow the pattern observed in the Northeast) and that these affected colonies will likely recover from most project related habitat impacts prior to any substantial WNS-related population reductions. Thus, the effects of most project impacts will be occurring to individuals and maternity colonies not yet affected by WNS. No mortality due to direct impacts during the construction period (first 1-3 years of the project) is anticipated (due to seasonal tree clearing restrictions) and therefore direct mortality of individual adult females (which are considered the most sensitive individuals) from highway construction activities is not anticipated. Some decrease in reproductive fitness could occur as a result of habitat loss. In the spring, pregnant females could abort their pups or experience a delay in fetal development if they are forced to search for new roosting and/or foraging habitat during this critical time when fat reserves are low and they are stressed from pregnancy and migration. Delayed parturition could result in decreased survivorship for the pups, with less time to build up fat reserves prior to hibernation.

If WNS effects manifest earlier than anticipated, we believe the effect of the project impacts could be greater. However, we anticipate that with declining numbers of bats, the number of bats exposed to the project impacts will be fewer as well, and hence, so too will the number of Indiana bats taken (See Appendix A, Table B4). In addition, with declining numbers of bats in an area, the colonies' foraging and roosting requirements would be less as well and we would anticipate that the loss of habitat would not cause the level of effects previously identified.

The proposed action includes numerous conservation measures, including forest habitat mitigation. The habitat mitigation efforts include 3:1 forest restoration/preservation with permanent protection, focused within each of the maternity colony areas. These properties will provide and maintain ample resources for the local Indiana bat populations throughout the project corridor. At least 2 known roost trees have been acquired as part of the mitigation efforts. In addition, over 450 acres of acquired bat habitat in Section 2 will be incorporated into the Patoka National Wildlife Refuge for permanent protection and management. Over the long term, mitigation efforts as part of this project will improve habitat conditions and protect Indiana bat summer habitat in perpetuity. Currently, nearly 2,200 acres within the Action Area have been permanently protected including 800 acres that will be reforested. Just over 1,500 acres fall within the various maternity colony areas and another 170 acres of habitat has been protected adjacent to these maternity areas. Three property owners have recently signed documents indicating their intent to sell or place conservation easements on their properties for an additional

700 acres of forest mitigation, including 79 acres of reforestation. A total of approximately 5,000 acres of restored and/or existing forested habitat is anticipated to be permanently preserved within Sections 1-4. Furthermore, almost all of the mitigation (proposed and acquired) in Section 4 (which contains most of the hibernacula) occurs within the swarming habitat of one or more of the 15 hibernacula in the area. Protection of Indiana bat hibernacula and associated habitat is discussed below. Early estimates for Indiana bat forest mitigation requirements for the final two sections of the project (5 and 6) indicate another 1,700 acres will eventually be permanently protected including a significant amount of restoration (over 500 acres). We anticipate that these mitigation efforts, over time, will offset the impact due to loss of foraging and roosting habitat for the Indiana bats exposed to the project. That is, we do not anticipate that any maternity colony's habitat will be reduced or degraded such that its survival or long-term reproductive success is hindered. Furthermore, the permanent protection of existing forested habitat within the Action Area will ensure that suitable habitat will remain in the Action Area in perpetuity and be protected from future development.

Some mortality may occur due to induced development where no seasonal tree-clearing restrictions would apply. Although any take of Indiana bats by any person or entity is prohibited, we expect indirect take via habitat loss occurs without the property owners or our knowledge. We do not expect much indirect development to occur in each section until a substantial amount of highway construction is underway and/or completed; to date, less than 2 miles of roadway has actually been constructed. The bulk of construction activities for Sections 1-4 will occur during the next couple of years. Indirect take will occur over a period of years and is not anticipated to eliminate or displace any colonies.

Roadkill may also result in direct death of maternity colony members; as with take from induced development, the full effect of the take is not anticipated to occur until the entire interstate is constructed and fully operational (*i.e.* free flowing traffic on all six sections). Until such time we expect only localized increases in traffic. In addition, some direct mortality from roadkill may be compensatory rather than additive as the number of roadkills currently occurring on local roads will decrease as traffic shifts to completed segments of the new I-69 roadway.

Although Indiana bats generally avoid crossing over open areas (Brack 1983; Menzel *et. al.* 2001), they have been documented flying over busy interstate highways such as I-70 near the Indianapolis Airport (USFWS 2002) and U.S. Route 22 near the Canoe Creek Church in Pennsylvania (Butchkoski 2003). In both of these circumstances, however, the road lies between known roosting and foraging areas for members of the colonies (Butchkoski 2003; D. Sparks, ESI, Inc., pers. comm. 2005). While it has been shown that Indiana bats will cross over busy highways when they divide foraging from roosting areas, it should also be noted that through a radio telemetry study by Indiana State University, Sparks (pers. comm.) observed that individuals of the Indianapolis Airport colony avoided flying over I-70 where a bridge provided a 35-ft high corridor beneath the road. The results of this particular study indicate that bats may avoid flying over highways when an alternative corridor is present. Recent research published by Zurcher *et. al*. 2010 indicates that bats may actually avoid traffic. In this study, bats were more than twice as likely to reverse their flight course crossing a road when vehicles were present. They found that when automobiles were present, 60% of bats exhibited avoidance behavior and reversed course at an average of 10 m from the vehicle. Conversely, when no automobiles were present, only 32% of bats reversed their course and 68% crossed the road.

Therefore, although it is logical to assume that some roadkill may occur, the amount of roadkill attributable to I-69 is somewhat speculative and will be difficult to detect. The roadkill estimates used for this project represent what we believe to be a reasonable worst-case scenario and could be reevaluated during subsequent Tier 2 consultations if more detailed information becomes available.

As with the other estimated forms of take, roadkill estimates were based on a percentage of each entire maternity colony being affected. If the number of colony members is decreased as a result of WNS, then the amount of bats exposed to roadkill, and therefore killed, would decrease as well. For example, 5% of each colony of 160 bats (8 bats total or 1 bat every other year) was estimated to be taken over a period of 17 years once the road was fully operational. If each colony is reduced by 60%, then 5% of 64 bats (3 bats total or 1 bat every 5 years) would be anticipated to be killed, reducing the total take from 104 to 42 bats over the 17 year period.

We believe the current estimates for roadkill, while reasonable, are very conservative (*i.e*. represent a worst-case scenario). Over the long-term, based on the recent research, availability and location of habitat, location of maternity colonies, and proposed bridge heights over larger streams, we do not believe the sporadic take of a few individuals every couple of years due to roadkill will hinder the long-term survival and reproductive fitness of any of the maternity colonies.

As indicated in the Tier 1 RPBO, none of the estimated take, direct or indirect, was expected to cause the loss or permanent displacement of any maternity colony. This assumption is still valid even if individual colonies decline to 64 bats (32 adult females) per colony. Because most take is in the form of temporary reductions in reproductive fitness and not direct death of maternity colony members, we do not anticipate the effects of the action to reduce the long-term survival or reproductive potential of the maternity colonies exposed to the project.

Adult Males (summer impacts)

Estimates of male bat density within the Action Area have been slightly adjusted since the 2006 Tier 1 RPBO. We estimate that half of the 97,688 bats (2009 estimate) using the hibernacula within the Action Area are males (48,844) and half of those would remain near their hibernacula during the summer reproductive season (24,422). The expanded WAA (portion of the Action Area where bats swarm and hibernate in fall and winter) consists of approximately 146,725 acres of tree cover which results in a density of male bats in the area of 0.17 bats/acre (24,422 bats/146,725 ac. = 0.17 bats/ac). For the portion of the Action Area that extends north and south of the hibernacula area, we assume the density of adult males is 0.085 adult males per acre of forested habitat (half of the density near their hibernacula). Using these density estimates and the number of acres impacted by the project (excluding the maternity colony areas), we estimated the number of bats exposed and impacted by the project and its various stressors (see Table B4). Because the number of male bats exposed to the project impacts during the summer has slightly increased, the original take estimates were proportionally increased resulting in a very small rise in estimated take of males during the summer. The take originally associated with utility relocations, however, has been recently reduced since those actions will be closely coordinated and will be permitted under the I69 project Incidental Take Permit and will comply with the associated Terms and Conditions.

If and/or when population declines associated with WNS are realized, male Indiana bat numbers would be equally as affected as females. As previously discussed, if the number of males using the Action Area is decreased, the estimated take would also decrease. With the exception of loss due to roadkill, direct loss of males during the summer months due to habitat loss (direct and indirect), noise, and disturbance of summer roosting in ungated hibernacula, is expected to be minimal; only 15 male bats throughout the life of the project. The number of road-killed male bats during the summer is also low, with 31male bats anticipated to be killed over a 17-year period once the highway is fully operational. With a portion of the take already occurring, and some occurring in small increments over a long period of time in the future, these impacts to male bats during the summer, even in light of WNS, will have no measureable impact on the Indiana bat populations to which these individuals belong.

Indiana Bats within the Wintering Portion of the Action Area (WAA) during the Spring, Fall and Winter

No direct adverse impacts are anticipated to any of the 15 Indiana bat hibernacula in the Action Area, although a small amount of take (24 bats through the year 2030) is anticipated due to loss of fall roosting and swarming habitat surrounding several of the hibernacula. The only hibernaculum that appears to have hydrological connectivity (*e.g.*, groundwater connections) with the proposed I-69 corridor is Cave. This cave is not currently, nor has it been in the past, an important hibernaculum for Indiana bats (*i.e*., it is a Priority 4 hibernaculum). Cave is prone to flooding and contained no hibernating Indiana bats when it was last surveyed in January 2005 (Brack et al. 2005). The bulk of anticipated take of bats during the fall, winter, and spring will likely be due to unauthorized, human disturbances of hibernating bats in vulnerable or unprotected hibernacula and roadkill of foraging bats (would primarily occur during the annual swarming period in late summer and fall). Ongoing monitoring at several of the major hibernacula in the area suggests that the number of unauthorized visits has decreased over the past several years (S. Johnson, IDNR, pers. comm.). This monitoring will provide baseline information regarding unauthorized visits once the highway is fully operational.

Take associated with roadkill and human disturbance is based on a percentage of exposed bats (estimated in 2006 to be 0.25% and 1%, respectively). Based on the latest population estimates for each of the hibernaculum within the Action Area, the number of Indiana bats taken by the various stressors during the fall swarming and spring staging periods and the winter hibernation months has increased (n = 883 bats) due to an overall increase in the local population using those hibernacula (an increase from 74,042 bats in 2005 to 97,688in 2009). Although the number of bats likely to be exposed and hence potentially taken has slightly increased, the percent of the overall population potentially affected over a 17-year period has actually decreased, from 1.2% to 0.9% (a large increase in bats at one of the protected caves did not result in any additional take and recent protection added to Cave will actually reduce the previously estimated take). Take associated with unauthorized visits is not anticipated to occur until a significant amount of the highway is constructed and operational, facilitating access to the general area.

Under a reasonable worst-case scenario (*i.e*. all hibernacula-related take occurring in a single year), the anticipated levels of take primarily based on roadkill and unauthorized disturbance/vandalism are not likely to significantly impact the RU. If and/or when WNS begins to negatively affect the local hibernating populations, we would also see a decline in the number of bats exposed to human disturbance and roadkill. All of the Priority 1A caves in the Action

Area are over 4.5 miles from the proposed I-69 roadway. Theoretically, if fewer bats are using the hibernacula and surrounding swarming habitat, we would expect the remaining bats to stay closer to the hibernacula during the swarming period and therefore their exposure and subsequent risk of take via roadkill on I-69 would likely be reduced. If the Action Area winter population is reduced by 60% due to WNS (*i.e.* the population decreased to 39,075), we estimate mortality due to roadkill would be approximately 6 bats per year once the highway is operational. We believe the winter population could withstand this loss and remain viable. In addition, cave closures and heightened awareness by the caving community of spreading the disease could result in decreases of local cave visits and minimization of take attributed to human disturbance.

To date, mitigation efforts have resulted in the permanent protection (including some reforestation) of over 600 acres within the winter portion of the Action Area (*i.e*. area surrounding all of the hibernacula; defined as WAA in the Tier 1 RPBO) and another 107 acres just outside this area, including one property with a small Indiana bat hibernaculum (Cave); eventually, between 2,878 and 3,583 acres of habitat will be acquired for mitigation purposes within and near one of the core hibernacula areas in the Midwest RU. Most importantly, a Notice of Intent to sell a permanent conservation easement for two Priority 1A Indiana bat hibernacula has been signed. This easement will permanently protect and Caves and nearly 300 acres of surrounding swarming habitat. Over 37,000 Indiana bats hibernated in these two caves in 2009. Permanent protection and management of these two caves will significantly reduce the take associated with unauthorized disturbance and vandalism at Cave. The 2006 Tier 1 RPBO estimated the take of over 180 bats at Cave through the year 2030 due to human disturbance; this will now be eliminated. Conservation easements on two other small Indiana bat hibernacula are also expected to be purchased in the near future. In addition, a conservation easement on a large cave in the Action Area not currently used by Indiana bats has been purchased with the intent to restore the caves airflow and surrounding forest in hopes it may eventually be suitable for Indiana bats. Should WNS drastically reduce the local Indiana bat population, the large amount of acquired mitigation property (including important hibernacula) will ensure that ample hibernating, roosting, swarming, and foraging habitat for Indiana bats remains in the Midwest Recovery Unit in perpetuity and reduce the potential for future habitat-related impacts to the local population. Management and protection of these important hibernacula will be critical for the protection, survival, and recovery of the species.

Little Clifty Branch Colony Analysis

In order to determine the amount of take anticipated for the newly discovered Little Clifty Branch colony, the likelihood of take for each stressor was analyzed for the new colony, as was done in the Tier 1 consultation for the other 13 colonies. The stressors likely to cause the most take at this maternity colony include loss of roosting and foraging habitat and roadkill. Although the primary roost tree for this colony was recently uprooted, we anticipate that when the colony returns this summer, they will choose another primary roost in the vicinity of their old one.

Loss of a primary roost tree or several surrounding secondary roosts could have adverse impacts at the colony level. Pregnant females would be required to search for new roosting habitat in the spring and this effort could place additional stress on the females at a critical time when fat reserves are low and they are already stressed from pregnancy and migration. This could cause the females to abort their pregnancy or delay fetal development; the latter could lead to less time for the newborn pups to build up fat reserves for winter hibernation, potentially reducing their survivorship. Furthermore, females may be forced to use roosts less effective in meeting thermoregulatory needs, or roost singularly or in small groups, which again may not meet their thermoregulatory needs and reduce their reproductive success. While some impacts are reasonably likely to occur as a result of the loss of a primary roost tree, given the inherent ability of the Indiana bat to adapt to the ephemeral nature of roost trees and the availability of suitable roosting and foraging habitat in the surrounding landscape, it is probable that the colony will be able to reestablish a new primary roost and additional alternate roosts within a fairly short period of time; loss of a primary roost tree is not expected to be a limiting factor for the success of this colony, particularly considering the amount and quality of surrounding forested habitat. Similar short-term impacts associated with locating new foraging habitat would also be expected once clearing activities begin.

Other impacts to the new colony include collision with fast-moving vehicles once the road is in operation. As previously discussed, although bats may cross roads while commuting between roosting and foraging habitat, several studies have indicated that they will do so primarily if roads divide foraging and roosting habitat. It should also be noted that studies at the Indianapolis Airport have indicated that bats may avoid flying over highways when an alternative corridor is present. In addition, more recent research at the Indianapolis Airport has revealed that bats will avoid traffic by reversing their flight course when vehicles are present on the roadway.

While there is some evidence that Indiana bats will fly across roads during the summer, it is unclear if the proposed road will present a physical barrier to the movements of Indiana bats. The Service anticipates that individual home ranges of Indiana bats that occur in the maternity colony area will be impacted differently depending upon the spatial extent to which the project will impact each bat's roosting, foraging, and commuting areas. The home ranges for some Indiana bats may be partially or even entirely divided by the project. These bats may modify their home ranges to avoid crossing the roadway or they may choose to cross the road (or cross under the road if bridging is sufficient) to access roosting or foraging areas. Bats that do cross the road will be subject to the risk of being struck by vehicles traveling on the roadway; bat mortalities from vehicle collisions, including at least one Indiana bat, have been documented at the Canoe Creek site in Pennsylvania (Butchkoski 2002). Based on the limited information we have regarding the Little Clifty Branch maternity colony, we conservatively assume up to 5% of the colony (8 bats) over a 17 year period could be impacted by fast-moving vehicles along the interstate once the highway is fully operational (*i.e*. all six sections are constructed and have free-flowing traffic). Some take may be offset as traffic (and some unknown amount of currently occurring take) on local roads (*e.g.* SR 45) is eventually diverted to the new interstate.

Other stressors evaluated for the new colony include construction noise/vibrations, and indirect loss of habitat due to utility relocation, home relocations, induced development, etc. The number of animals per colony exposed and affected by all of these various stressors is estimated based on a variety of variables including: the location of the right-of-way within the maternity colony area, amount and location of tree cover before and after construction, location of known roost trees, connectivity of remaining habitat, anticipated indirect and cumulative impacts, etc. Many of these factors are specifically discussed within the Tier 1 Biological Assessment (BA) Addendum, Tier 1 RPBO and the subsequent Tier 2 BAs. The Tier 2 BA and BO for Section 4 will address this colony in more detail. Please refer to Table B4 in Appendix A for additional information regarding the amount of take anticipated for this colony (note that these estimates are through the year 2030). Based on the impacts discussed above (as well as the proposed mitigation efforts) and the amount and location of existing foraging and roosting habitat, we do not anticipate the effects of the action to reduce the long-term survival or reproductive potential of this maternity colony.

Cave Critical Habitat

The revised preferred alignment for the County Line Interchange connector road will consist of approximately 26 acres of right-of-way that falls within the Indiana bat swarming habitat surrounding Cave (an important conservation feature of the critical habitat) and will result in approximately 16.2 acres of direct tree cover loss. The 5-mile radius of swarming habitat contiguous with Cave contains 32,607 acres of tree cover therefore a loss of 16.2 acres represents about 0.05% of the existing available habitat. The selection of the southern connector option does not increase the other stressors considered in the Tier 1 evaluation including the amount of induced impacts anticipated within the area surrounding Cave and the overall potential for increased vandalism of the cave. The slight impact to the swarming habitat surrounding Cave will not significantly reduce the quality or quantity of the habitat and this area will likely still support the number and overall fitness of Indiana bats occupying this site as they prepare for hibernation in the fall and when they emerge from hibernation and prepare to migrate in the spring. These impacts will not affect Cave itself, or measurably adversely affect any of the important conservation features of Cave.

Conclusion

(Our non-jeopardy conclusion regarding impacts to the bald eagle still stands as stated in the original December 3, 2003 Tier 1 BO.)

After reviewing the current status of the Indiana bat, updated information regarding WNS and the environmental baseline for the action area, and new information regarding the preferred alignment of the road connecting the County Line Interchange to SR 45/54/445 in Greene County, the USFWS has concluded that appreciable reductions in the likelihood of survival and recovery of Indiana bats due to the construction, operation, and maintenance of I-69 from Evansville to Indianapolis, Indiana are unlikely to occur, and hence, FHWA has ensured that their proposed action is not likely to jeopardize the continued existence of the Indiana bat or destroy or adversely modify its designated critical habitat.

Our basis for this conclusion follows:

- An increase in the number of swarming habitat acres affected (16.2 acres of tree cover out of 32,607 acres) surrounding Cave will not reduce the value of the habitat and this area will continue to support the survival and fitness of Indiana bats as they prepare for hibernation in the fall and when they emerge from hibernation and prepare to migrate in the spring. Any impacts from this loss are considered immeasurable, and thus, will not reduce the likelihood of conserving the Indiana bat in the Midwest RU.

- Because I-69 will have a long narrow/linear footprint, the amount of adverse impacts to any one habitat patch or maternity area along its path is minimal when compared to impacts of a similarly sized area that has a non-linear configuration.

- In general, areas with less than 5% forest cover are not capable of sustaining an Indiana bat maternity colony. Currently, forest coverage (*i.e*. tree cover) in the maternity colonies ranges from 10.5% to 70% (estimates for tree cover loss at the colony with 10.5% cover is only 1 acre total); see Table B2 for tree cover estimates per colony. The construction of I-69 will directly reduce the total amount of forest habitat/tree cover available around each of the 14 colonies and in some cases will cause small additional amounts to be indirectly lost by induced development. When combined, the percentages of existing tree cover that will be directly and/or indirectly impacted at each maternity colony is very small. Ten of the 14 colonies will lose less than 1% of their tree cover, and the other four will lose 1.4%, 1.7%, 2.1% and 2.6%;therefore the total amount of forest loss is insignificant for each colony. We do not anticipate any long-term reductions in maternity colony reproductive success or survival as a result of this loss.

- We do not believe that any of the 14 maternity colonies will be permanently displaced by the interstate; that is, sufficient quality and quantity of habitat will remain throughout the life of the project. In addition, the proposed 3:1 mitigation commitment for upland forest losses will largely be focused on improving forest habitats within these affected maternity colony areas, and thus, any adverse habitat impacts to these colonies will be temporary.

- We estimated the maximum overall amount of I-69 related incidental take of Indiana bats **during the summer** will be no more than 304 bats (253 females/juveniles and 51 males) spread over a 17-year long period. On an annual basis, this equates to about 18 bats being taken per year throughout the entire project corridor. Table B4 in Appendix A breaks down the anticipated take by colony. This total take equates to less than 1% of the Indiana bat population that occupies these areas each summer.

- The proposed action will only directly or indirectly take a relatively small number of bats **during fall, winter and spring** (estimated total = 883 bats over a 17-year long period or about 52 bats/year; see Table B5) and will only have minimal, short-term effects on these bats' respective maternity colonies and hibernating populations. The estimated amount of yearly take represents only 0.05% of the *annual* winter population within the Action Area. Loss of these individuals will have no measurable effects on the viability of other maternity colonies in the region or the species' range or to hibernating populations to which these individuals belong. Again, the proposed action in combination with relatively small amounts of cumulative impacts/take is not reasonably expected, directly or indirectly, to cause an appreciable reduction in the reproduction, numbers or distribution of the Indiana bat as a species.

- In the event that a 60% population decline over a period of several years does occur within the Midwest RU due to WNS, the estimated take of 883 bats over a 17-year period **during the fall, winter, and spring** would reduce the WNS-impacted RU population by another 0.8%. We believe this small additional impact is not measurable and therefore will not result in any appreciable reduction in the survival or recovery potential for the species within the Midwest RU. Furthermore, this does not take into consideration that the amount of estimated take would also be proportionally reduced in a WNS-affected population (i.e. take would be closer to 353 individuals over a 17-year period) since the number of bats exposed to the various stressors would also decrease.

- In the same vein, if the maternity colonies in the action areas were to see a 60% reduction in their number of members, we would expect most take to also be proportionally reduced.
- The combined estimated amount of I-69-related take during the summer maternity season and swarming, hibernation, and spring staging period, including estimated take from cumulative effects (non-federal actions apart from I-69; see Tier 1 RPBO for details and Tables B4 and B5 for cumulative take estimates) equals 2,159 bats over a 17-year period (127 bats/year). Again, we believe this level of yearly take is insignificant because it equates to 0.04% of the annual Midwest Recovery Unit population (based on 2009 data) and 0.03% of the annual range-wide population estimate of *M. sodalis* (again, based on 2009 population data). Much of the take (*i.e.* harm, harassment, wounding and killing) will be short-term/temporary in nature and the population should be able to absorb this amount of loss.
- If WNS reduces the Midwest RU population by 60% over the next several years, the estimated take (project-related and cumulative; n=2,159) would equal approximately 1.9% of the impacted Midwest RU population.
- Mitigation and conservation efforts associated with the project will include over 2,200 acres of reforestation (including permanent protection) and permanent protection of an additional 4,000-plus forested acres, managed for the Indiana bat and other wildlife species. Reforestation efforts will more than offset the anticipated direct forest loss and the additional acreage of forest preservation will ensure suitable bat habitat remains in the area in perpetuity.
- Documents confirming the intent to have a permanent conservation easement placed on the third and fourth largest hibernacula in the state (and Caves) have been signed; protection of these hibernacula will be very important for the long term protection and recovery of the species. Specifically, permanent protection at Cave will eliminate the estimated take due to vandalism and human disturbance. Furthermore, permanent protection of both caves and their surrounding forests will provide long-lasting protection for essential fall swarming habitat for the 37,000 Indiana bats that use these caves and eliminate future possibilities for this property to be developed.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are **non-discretionary**, and must be undertaken by the FHWA or their designee (e.g., INDOT) for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Since the Tier 1 Consultation (and Tier 1 RPBO dated August 24, 2006), there have been additional refinements to the alignment for Sections 1, 2, 3, and 4, more accurate habitat impact calculations, as well as updated Indiana bat population estimates. Those numbers have been updated in this amended Incidental Take Statement(ITS) to the Tier 1 RPBO; however, the maximum take permitted for this project (using habitat acreage as a surrogate for the Indiana bat) has not changed. The entire ITS is presented below although most of the information is unchanged from the 2006 Tier 1 RPBO ITS.

INDIANA BAT

AMOUNT OR EXTENT OF TAKE

The Service believes it is reasonably certain to anticipate that incidental take of Indiana bats will occur as a direct or indirect result of the Proposed Action in the following forms:

- death/kill and/or injury/wound from direct felling of occupied trees (during indirect/induced development),

- death/kill and/or injury/wound from direct collision with vehicles traveling on I-69 once it is operational (*i.e*., roadkill),
- death/kill/wound/harassment of hibernating Indiana bats in unprotected Indiana bat hibernacula as an indirect result of project-induced population growth and increased vehicular accessibility to hibernacula areas,
- harassment of roosting bats from noises/vibrations/disturbance levels causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time, and
- harm through loss of roosting habitat such as primary and/or alternate roost trees, and loss of foraging habitat.

Based on our knowledge of the ecology of Indiana bats, and the distribution of Indiana bats within the Action Area of I-69, we assume that the habitat that will be lost will adversely affect the roosting and foraging habitat of Indiana bats.

Based on our analysis of the environmental baseline and effects of the proposed action, the Service anticipates that 14 Indiana bat maternity colonies occupy the Action Area and therefore may be impacted as a result of the proposed activities. The effect of the loss of foraging habitat is expected to result in the harm of some bats (*e.g*., as the result of exposure to predation or overwinter mortality of bats that failed to store adequate fat reserves). Loss of roosting habitat and degradation of remaining habitat may also result in harm of individual bats. While some adverse effects are not expected to directly result in the death of bats, they may exacerbate the effects of other ongoing stressors on the bats. Collectively, the effects of the action are expected to result in behavioral or physiological effects which impair reproduction and recruitment, or other essential behavioral patterns. We anticipate take/death of individuals, decreased fitness of individuals, reduced reproductive potential, and reduced overwinter survival of an estimated maximum of 304 Indiana bats within the Action Area during the summer and 883 Indiana bats during the fall, winter, and spring as detailed in Tables B4 and B5 in Appendix A, respectively. The effects on the 14 known maternity colonies may be lost reproductive capacity and potentially a short-term decline in their colony sizes. No significant, long-term adverse effects to affected maternity colonies are anticipated.

Construction of I-69 along the proposed 3C alignment and its associated actions is expected to result in the permanent loss of just over 2,000 acres of suitable summer foraging and roosting habitat for Indiana bats, a decrease of approximately 130 acres from the 2006 Tier 1 RPBO estimate. Degradation of remaining habitat is also likely to occur from increased fragmentation and increased disturbance.

It is unlikely that direct mortality of small-sized bats from roadkill will be detected, that is, we do not expect that most dead or moribund bats are likely to be found. The same is true for take associated with habitat modification/loss and disturbance; detecting or finding dead individuals is unlikely. Therefore, the anticipated levels of take primarily are being expressed below as the permanent, direct loss of currently suitable summer roosting and foraging habitat and fall swarming and staging habitat in the Action Area for Indiana bats that will result from project implementation as estimated in the Tier 1 BA Addendum and subsequent Tier 2 BAs for Sections 1, 2, and 3. Human vandalism and disturbance at the various hibernacula will be tracked via routine surveys and existing data loggers at most sites. Finally, the FHWA will record and track any known Indiana bat roadkills to ensure that the anticipated amount of incidental take is not exceeded.

Summer Action Area:

Permanent direct loss of up to 2,014 acres of forest habitat and 20 acres of non-forested wetlands is anticipated. Approximate direct loss of Tier 2 Forest within each project section is summarized in Table 1 below. New estimates were based on refinements detailed in Tier 2 Biological Assessments for Sections 1, 2, 3, and 4; data from Table 3 of the Tier 1 BA Addendum was used for Sections 5 and 6.

Table 1. Tier 1BA Addendum Estimated Direct Loss of Forest within the I-69 Summer Action Area and Revised Estimates for Forest Loss based on Tier 2 numbers.

Project Section	Tier 1 BA Addendum Estimated Direct Loss of Tier 2 Forest (acres)	Revised Tier 2 Estimated Direct Forest Loss (acres) including utility-related forest impacts
1	55	30
2	280	237
3	112	71
4	1,132	1107
5	303	303*
6	266	266*
Total	**2,148**	**2,014**
***From Tier 2 Representative Alignments as described in the Tier 1 BA Addendum.**		

Winter Action Area (overlaps with Summer Action Area):

Permanent direct loss of up to 1,234 acres of forest habitat surrounding the 15 known hibernacula (and expanded in areas where induced growth is likely) is anticipated (from the Tier 2 Section 4 BA). Approximate direct loss of Tier 2 Forest within a 5-mile radius of each hibernaculum is summarized in Table 2 below. The sum of the individual acreages is greater than 1,234 acres because of a high degree of overlap among the impacted acres surrounding the hibernacula.

Hibernaculum Name	Updated Direct Loss of Tier 2 Forest (acres)
Cave:	605.37
Cave:	528.58
Cave:	468.98
Cave:	406.69
Cave :	458.18
Cave:	312.10
Cave:	343.71
Cave:	290.41
Cave System:	259.10
Cave:	97.24
Cave:	98.18
Cave:	84.69
Cave:	54.74
Cave:	0
Cave:	11.80

Table 2. Updated Estimated Direct Loss of Tier 2 Forest within a 5-mile radius of each Hibernaculum within the I-69 Winter Action Area.

Roadkill:

The Service anticipates that all bats that are struck by vehicles likely will be killed. The Service assumes that the annual number of deaths by vehicle collisions is not likely to exceed 22 Indiana bats per calendar year through the year 2030. The anticipated 5% mortality rate is not expected to commence until the highway is completely constructed and fully operational; some smaller percentage of bats may be impacted as significant portions are completed. It is likely that the anticipated amount of roadkill will be somewhat off-set when local traffic begins to divert to the interstate, therefore lowering roadkill along existing highways and roads. Based on the best available scientific data, the actual number of Indiana bats that may be struck and killed from vehicles traveling on I-69 between Evansville and Indianapolis cannot be precisely quantified and dead bats will be difficult to locate once I-69 is operational. If more specific information becomes available, then this issue will be reexamined during the Tier 2 project-section consultations and prudent adjustments will be made at that time.

EFFECT OF THE TAKE

In the accompanying amendment to the Tier 1 RPBO, the Service determined that the aggregate level of anticipated take is not likely to result in jeopardy to Indiana bats or destruction or adverse modification of designated Critical Habitat (*i.e.*, Cave).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of Indiana bats:

1. In the Tier 1 BA Addendum (also listed in the Tier 1 RPBO, pg. 16), the FHWA proposed to investigate and/or implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of wildlife species, including Indiana bats. The Service will take the necessary steps to ensure that the FHWA successfully implements all the conservation measures to the fullest extent practicable.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

3. All I-69 construction personnel and INDOT maintenance staff need to be made aware of potential issues concerning Indiana bats and construction and maintenance of I-69.

4. The FHWA needs to ensure that the impacts of take associated with future Tier 2 section-specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented and anticipated levels of incidental take will not be exceeded nor will any new forms of take occur that were not anticipated in Tier 1RPBO or the recent amendment to the Tier 1 RPBO.

The Service believes that the measures above are necessary, appropriate, and reasonable for minimizing take of Indiana bats.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA (and/or INDOT and their contractors or assigns) must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. The FHWA must implement all proposed mitigation and conservation measures, as detailed in the revised "Tier 1 Forest and Wetland Mitigation and Enhancement Plan" and "Conservation Measures for Impacts to Threatened and Endangered Species" sections of the Tier 1 BA Addendum and Appendix B of the Tier 1 BA or alternative measures that are of equal or greater benefit to Indiana bats as developed in consultation with the Service during Tier 2 consultations.

2. FHWA will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service's BFO by 31 January each year and reporting will continue for at least 5 years post-construction or until otherwise agreed to with the Service.

   If proposed conservation measures or mitigation goals cannot be realized (e.g., lack of willing-sellers), then FHWA will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to Indiana bats within the Summer and Winter Action Areas.

3. All I-69 engineering supervisors, equipment operators, and other construction personnel and INDOT (and/or concessionaire) maintenance staff will attend a mandatory environmental awareness training that discloses where known sensitive Indiana bat sites are located in the project area, addresses any other concerns regarding Indiana bats, and presents a protocol for reporting the presence of any live, injured, or dead bats observed or found within or near the construction limits or right-of-way during construction, operation, and maintenance of I-69.

4. To ensure that the impacts of take associated with future Tier 2 project-section specific action are appropriately minimized and that the exemption of incidental take is appropriately documented, the U.S. Fish and Wildlife Service has or will prepare an individual Tier 2 BO for each of the six Tier 2 Sections for which we conclude will be likely to adversely affect the Indiana bat (*Myotis sodalis*) and/or bald eagle (*Haliaeetus leucocephalus*). The Tier 2 BO for a Section will be a stand-alone document that "tiers" back to the Tier 1 Revised Programmatic BO (as amended), rather than being physically appended to it as previously described.

   While conducting each of the Section-specific "second tier" consultations, the Service has or will ensure that each action proposed under I-69's programmatic-level design standards (1) are consistent with the previously evaluated standards and conservation commitments (2) will have the effects anticipated during the landscape/programmatic-level analysis, that is, that there is nothing unusual about the proposed Section-specific project that will result in unanticipated impacts, and (3) that the environmental baseline will be appropriately updated.

As previously proposed, the Service has or will review the information provided by FHWA and INDOT within each of the Tier 2 Biological Assessments (BAs) for each I-69 Section. We will (1) confirm the species that may be affected, (2) assess how the action may affect the species, including ensuring that the level of effect is commensurate with the effects contemplated in the Tier 1 programmatic-level BO, and (3) verify the current tally of the cumulative total of incidental take that has occurred to date is below the levels anticipated in the 2006 programmatic incidental take statement (ITS) as amended (2011). During this review, if it is determined that an individual Section of I-69 is not likely to adversely affect listed species, the Service has or will complete its documentation with a standard concurrence letter stating that the Service concurs that the proposed project Section is not likely to adversely affect listed species or designated critical habitat. The concurrence letter will refer to the Tier 1 Revised Programmatic BO (*i.e.*, it "tiers" to it), and specify that the Tier 2 BA is consistent with the analysis underlying the Tier 1 Revised Programmatic BO (as amended). However, if information presented in a Tier 2 BA establishes that the proposed Section-specific actions are likely to adversely affect listed species or designated critical habitat, then the Service will complete a Tier 2 BO along with a Section-specific ITS. No incidental take shall be exempted until after a Tier 2 BA has been reviewed and has been found to be consistent with Tier 1 in a Section-specific concurrence letter, or until a Section-specific Tier 2 BO and ITS have been completed by the Service.

Because acreages of lost Indiana bat habitat are being used as a surrogate to monitor levels of incidental take within the entire Action Area as well as within each Tier 2 Project Section and 5-mile radius around each known hibernaculum, the FHWA will provide the Service's Bloomington Field Office with a detailed description of each project section's contribution to habitat loss by preparing a Tier 2 Biological Assessment for each project section. The Tier 2 Biological Assessments must include: maps of the preferred final alignment and all associated development; methods and results of Tier 2 mist net surveys, radio-tracking studies, roost tree emergence counts, and hibernacula surveys; exact locations of all known and newly discovered Indiana bat roost trees and hibernacula (hibernacula location maps must identify known hydrologically connected surface streams and sinkholes and their drainage basins and delineate approximate boundaries of potential recharge areas for each hibernaculum within the Action Area in relation to I-69's direct and indirect impacts as identified during Tier 2 and previous studies); the total acreages and relative quality of forest (e.g., maturity of forest/estimated dbh of live canopy trees and estimated suitability for roosting/estimated number and dbh of snags) and wetland habitats that will be directly impacted and permanently cleared/filled; and all other anticipated project section-specific impacts. Tier 2 BAs must also describe any additional direct or indirect effects that were not considered during the Tier 1 programmatic-level consultation. To reduce redundancy, Tier 2 BAs should summarize or simply reference sections of the Tier 1 BA and BA Addendum that would otherwise be repetitive.

Each Tier 2 BA must quantify how the individual Tier 2 project section's direct impact acres contribute to the estimated project section-specific and hibernacula-specific acres (see Tables 1 and 2 above) as well as to the project-wide forest acres (2,014 ac.) and non-forested wetland acres (20 ac.) as specified in the AMOUNT OR EXTENT OF TAKE section above. The Tier 2 BAs should also report how much total acreage remains for the overall I-69 project and within each project section in the SAA and hibernacula in the WAA (*i.e.*, provide the running totals and the remaining balances for these exempted levels of take).

FHWA's cover letters requesting project-section specific ESA Section 7 reviews must include a determination of whether or not the proposed project is consistent with the Tier 1 Programmatic Biological Opinion and Incidental Take Statement (as amended) and request a Section-specific concurrence letter or initiation of Formal Consultation resulting in a Section-specific Tier 2 BO and ITS. The cover letter, and one bound hard copy and an electronic copy of the Tier 2 BA should be submitted to the BFO when requesting a project section review.

5. Any dead bats located within the construction limits, right-of-way, rest stops, or mitigation areas of I-69, regardless of species, should be immediately reported to BFO [(812) 334-4261], and subsequently transported (frozen or on ice) to BFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to BFO. BFO will make a species determination on any dead or moribund bats. If an Indiana bat is identified, BFO will contact the appropriate Service Law Enforcement office as required.

   The FHWA will keep track of all known Indiana bats killed from vehicle collisions to ensure that the anticipated amount of incidental take, <u>22 killed per calendar year,</u> is not exceeded.

<u>ATTENTION</u>: If at any point in time during this project, the exempted project-wide or section-specific, or hibernacula-specific habitat acreages or annual number of roadkilled bats quantified in the AMOUNT OR EXTENT OF TAKE section of this ITS are exceeded by more than 10%, then the Service will assume that the exempted level of take for this project may have been exceeded and the FHWA should immediately reinitiate formal consultation.

In conclusion, the Service believes that the permanent loss of currently suitable summer roosting and foraging habitat for Indiana bats will be limited to a maximum of 2,014 acres of forest habitat and 20 acres of non-forested wetlands within the Summer Action Area (the portion of the Action Area used by the Indiana bat in the summer) and including 1,234 acres of forest habitat that also falls within the Winter Action Area (portion of the Action Area used by the Indiana bat during the fall, winter, and spring). These acreages represent approximately a 1% loss of the SAA's forested acreage and a 1% loss of the WAA's forested acreage and will occur over a period of at least several years. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded (or tree clearing occurs during the period April 1-September 30 in the SAA or April 1-November 15 within the WAA any given year) such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

BALD EAGLE

(This section has not been revised since the original 2003 Biological Opinion except for a brief discussion of the tiered consultation approach.)

AMOUNT OR EXTENT OF TAKE

The Service anticipates that incidental take of bald eagles will occur in the form of death or injury resulting from collisions with vehicles once I-69 is operational. Based on the best available scientific data, the actual number of eagles that may be struck and killed/injured from vehicles traveling on I-69 between Evansville and Indianapolis cannot be precisely quantified. The Service anticipates that collisions with eagles would most likely occur during the winter when food is more scarce and eagles are more apt to scavenge on carrion from roadkilled animals. Once I-69 is operational, we anticipate that all eagles that are struck by vehicles will be killed or injured and that the number of deaths and/or injuries would not exceed 3 bald eagles during any five-year period. Because bald eagles are large birds and would be widely recognized by most motorists and maintenance workers, we anticipate most roadkilled or injured eagles would eventually be reported to the Service, and therefore, the actual level of incidental take could be fairly accurately monitored over time.

The amount of forested habitat that will be permanently cleared for construction of bridges at the two major river crossings (E. Fork of White River and Patoka River, where bald eagles are most likely to occur) was not quantified in the Tier1 BA. However, from our review of aerial photos and maps of the project area, we anticipate that the total combined amount of forest that will be lost at these two river crossing will be equal to or less than 50 acres and that an ample amount of habitat will remain available to bald eagles in these areas. Furthermore, the potential for incidental take from loss of future eagle habitat will be minimized by the proposed forest and wetland mitigation efforts. Therefore, we believe that if forest loss at these sites is equal to or less than 50 acres, then the impact will be insignificant in size and not likely to adversely affect nesting or wintering eagles.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to bald eagles. No critical habitat has been designated for bald eagles, so none would be impacted.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of bald eagles:

1. In the Tier1 BA, the FHWA proposed to investigate and/or implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of wildlife species, including bald eagles. The Service will take the necessary steps to ensure that the FHWA successfully implements all the conservation measures to the fullest extent practicable.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

3. All I-69 construction workers and INDOT maintenance staff need to be made aware of potential issues concerning bald eagles and construction and maintenance of I-69.

4. The FHWA needs to ensure that the impacts of take associated with future Tier 2 project-section specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented and anticipated levels of incidental take will not be exceeded or that any new forms of take may occur that were not anticipated in Tier 1.

The Service believes that the measures above are necessary, appropriate, and reasonable for minimizing take of bald eagles.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA (and/or INDOT and their contractors or assigns) must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. The FHWA must implement all proposed mitigation and conservation measures, as detailed in the "Tier 1 Forest and Wetland Mitigation and Enhancement Plan" and "Conservation Measures for Impacts to Threatened and Endangered Species" sections and Appendix B of the Tier 1 BA or alternative measures that are of equal or greater benefit to bald eagles as developed in consultation with the Service during Tier 2.

2. The FHWA will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service's BFO by 31 January each year and reporting will continue for at least 5 years post-construction or until otherwise agreed to with the Service.

If proposed conservation measures or mitigation goals cannot be realized (e.g., lack of willing-sellers), then FHWA will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to bald eagles within the Bald Eagle Action Area.

3. All I-69 engineering supervisors, equipment operators, and construction workers and INDOT (and/or concessionaire) maintenance staff will attend a mandatory environmental awareness training that discloses where known bald eagle nests are located in the project area, addresses any other concerns regarding bald eagles, and presents a protocol for reporting any eagle nests, and any live, sick, injured, or dead eagles observed or found within or near the construction limits or right-of-way during construction, operation, and maintenance of I-69. Project personnel will also be instructed about the terms and conditions of the ITS and the restrictions imposed by them before construction and operation begins.

4. To ensure that the impacts of take associated with future Tier 2 project-section specific action are appropriately minimized and that the exemption of incidental take is appropriately documented, the U.S. Fish and Wildlife Service has or will prepare an individual Tier 2 BO for each of the six Tier 2 Sections for which we conclude will be likely to adversely affect the Indiana bat (*Myotis sodalis*) and/or bald eagle (*Haliaeetus leucocephalus*). The Tier 2 BO for a Section will be a stand-alone document that "tiers" back to the Tier 1 Revised Programmatic BO (as amended), rather than being physically appended to it as previously described.

   While conducting each of the Section-specific "second tier" consultations, the Service will ensure that each action proposed under I-69's programmatic-level design standards (1) are consistent with the previously evaluated standards and conservation commitments (2) will have the effects anticipated during the landscape/programmatic-level analysis, that is, that there is nothing unusual about the proposed Section-specific project that will result in unanticipated impacts, and (3) that the environmental baseline will be appropriately updated.

   As previously proposed, the Service will review the information provided by FHWA and INDOT within each of the forthcoming Tier 2 Biological Assessments (BAs) for each I-69 Section. We will (1) confirm the species that may be affected, (2) assess how the action may affect the species, including ensuring that the level of effect is commensurate with the effects contemplated in the recently amended Tier 1 programmatic-level BO (2011), and (3) verify the current tally of the cumulative total of incidental take that has occurred to date is below the levels anticipated in the amended 2006 programmatic incidental take statement (ITS). During this review, if it is determined that an individual Section of I-69 is not likely to adversely affect listed species, the Service will complete its documentation with a standard concurrence letter stating that the Service concurs that the proposed project Section is not likely to adversely affect listed species or designated critical habitat. The concurrence letter will refer to the amended Tier 1 Revised Programmatic BO (*i.e.*, it "tiers" to it), and specify that the Tier 2 BA is consistent with the analysis underlying the Tier 1 Revised Programmatic BO (as amended in 2011). However, if, information presented in a Tier 2 BA establishes that the proposed Section-specific actions are likely to adversely affect listed species or designated critical habitat, then the Service will complete a Tier 2 BO along with a Section-specific ITS. No incidental take shall be exempted until after a Tier 2 BA has been reviewed and has been found to be consistent with the Tier 1in a Section-specific concurrence letter, or until a Section-specific Tier 2 BO and ITS have been completed by the Service.

Because acreages of lost bald eagle habitat are being used to ensure that habitat loss in eagle use areas (Patoka River and E. Fork White River crossings) does not reach the scale where take will occur, the FHWA will provide the Service's Bloomington Field Office with a detailed description of each project sections contribution to habitat loss by preparing Tier 2 Biological Assessments for each project section. The Tier 2 Biological Assessments must include: maps of the preferred final alignment and all associated development; methods and results of Tier 2 bald eagle surveys (i.e., current IDNR data should be sufficient), exact locations of all known and newly discovered eagle nests, night roosts, and other important areas; the total acreages and relative quality of forest (i.e., as compared to the maturity of forests and estimated suitability for nesting, perching, roosting in the immediate area) and wetland habitats that will be permanently cleared/filled. Tier 2 BAs must also describe any additional direct or indirect affects that were not considered during the programmatic consultation. To reduce redundancy, Tier 2 BAs should summarize or simply reference sections of the Tier 1 BA that would otherwise be repetitive.

The cover letter, and one bound hard copy and an electronic copy of the Tier 2 BA should be submitted to the BFO when requesting a project section review.

5. Any dead bald or golden eagles found within the construction limits, right-of-way, rest stops, or mitigation areas of I-69, should be reported to BFO [(812) 334-4261] as soon as possible and subsequently transported (frozen or on ice) to BFO.

   Any sick or injured bald or golden eagle located within the construction limits, right-of-way, rest stops, or mitigation areas of I-69 should immediately be reported to BFO (and an Indiana Conservation Officer or the State Police if outside of normal business hours or on weekends). If possible, attempts should be made to remove an injured eagle from harm's way, until a trained person arrives to safely capture and transport the bird. Sick and injured eagles will be transported to a veterinarian or a rehabilitation center that has a valid Federal permit to treat and rehabilitate eagles.

   BFO will contact the appropriate Service Law Enforcement office to report that a sick, injured, or dead eagle has been found.

   The FHWA will keep track of all known bald eagles killed or injured from vehicle collisions to ensure that the anticipated amount of incidental take, <u>3 killed/injured bald eagles during any five-year period,</u> is not exceeded.

   The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-

712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions specified herein.

In conclusion, the Service anticipates that the number of deaths and/or injuries from vehicle collisions would not exceed 3 bald eagles during any five-year period. If this level of take or less occurs, we expect that the effects to Indiana breeding and wintering bald eagle populations will be negligible. We anticipate that if 50 or less acres of forested habitat that will be permanently cleared for construction of bridges at the two major river crossings, East Fork of the White River and the Patoka River, where bald eagles are most likely to occur, then the impact will be insignificant in size and not likely to adversely affect nesting or wintering bald eagles. Impacts to eagle habitat will also be minimized by the proposed conservation measures and forest and wetland mitigation efforts. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action/program on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations generally do not focus on a specific project, but rather on an agency's overall program.

The Service provides the following conservation recommendations for the FHWA's consideration; these activities may be conducted at the discretion of FHWA as time and funding allow:

INDIANA BAT

1. Working with the Service, develop national guidelines for addressing Indiana bat issues associated with FHWA projects within the range of the Indiana bat.

2. Expand on scientific research and educational outreach efforts on Indiana bats in coordination with the Service's BFO.

3. In coordination with the BFO, purchase or otherwise protect additional Indiana bat hibernacula and forested swarming habitat in Indiana.

4. Provide funding to staff a full-time Indiana bat Conservation Coordinator position within the BFO, which has the Service's national lead for this wide-ranging species.

5. Provide funding for research to address WNS in bats.

BALD EAGLE

1. Working with the Service, develop guidelines for addressing Bald Eagle issues associated with FHWA projects in the Midwest.

2. Provide funding to implement a bald eagle post-delisting monitoring plan in Indiana or throughout the Midwest.

3. Expand on educational and outreach efforts on bald eagles in Indiana.

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

REINITIATION NOTICE

This concludes formal programmatic consultation with FHWA on the construction, operation, and maintenance of the I-69 from Evansville to Indianapolis, Indiana and associated development. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action (e.g., highway construction and associated development) are subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Literature Cited

Blehert, D.S., A.C. Hicks, M. Behr, C.U. Meteyer, B.M. Berlowski-Zier, E.L. Buckles, J.T.H. Coleman, S.R. Darling, A. Gargas, R. Niver, J.C. Okoniewski, R.J. Rudd, and W.B. Stone. 2009. Bat white-nose syndrome: an emerging fungal pathogen? Science 323:227.

Brack, V., Jr. 1983. The non-hibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Ph.D. dissertation, Purdue Univ., West Lafayette, Ind. 280 pp.

Brack, V., Jr., and J. Duffey. 2005. A 2004-2005 winter survey for Indiana bats (Myotis sodalis) in hibernacula of Indiana. Unpublished technical report prepared by Environmental Solutions, Inc. and the Indiana Karst Conservancy for the Indiana Department of Natural Resources, Division of Fish and Wildlife, Wildlife Diversity Section. 91 pp.

Butchkowski, C. M., and J. M. Hassinger. 2002. Ecology of a maternity colony roosting in a building. Pp. 130–142, *in* The Indiana bat: biology and management of an endangered species (A. KURTA and J. KENNEDY, eds.). Bat Conservation International, Austin, Texas, 253 pp.

Butchkowski, C. M. 2003. Indiana Bat (*Myotis sodalis*) Investigations at Canoe Creek, Blair County Pennsylvania. Report to Pennsylvania Game Commission, Bureau of Wildlife Management. 13 pp.

Gargas, A., M.T. Trest, M. Christensen, T.J. Volk, and D.S. Blehert. 2009. *Geomyces destructans* sp. nov. associated with bat white-nose syndrome. Mycotaxon 108:147-154.

Hicks, A. and D. Newman. 2007. Bat Management and Protection in New York State, Fiscal Year April 1, 2006-April 1, 2007. New York Department of Environmental Conservation, Albany, NY.

Hicks, A.C., C.J. Herzog, R.I. von Linden, S.R. Darling, and J.T.H. Coleman. 2008. White-Nose Syndrome, field observations from the first two winters. Proceedings of the first national White-Nose Syndrome meeting, Albany, New York, 9-11 June 2008.

Humphrey, S.R., A.R. Richter, and J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. Journal of Mammalogy 58:334-346.

Menzel, M.A., J.M. Menzel, T.C. Carter, W.M. Ford, J.W. Edwards. 2001. Review of the forest habitat relationships of the Indiana bat (*Myotis sodalis*). USDA Forest Service, Pennsylvania.

Puechmaille, S.J., P. Verdeyroux, H. Fuller, M. ArGouilh, M. Bekaert, E.C. Teeling. 2010. White-nose syndrome fungus (*Geomyces destructans*) in bat, France. Emerging Infectious Diseases 16:290-293.

U.S. Fish and Wildlife Service. 1983. Recovery Plan for the Indiana Bat. Twin Cities, MN.

U.S. Fish and Wildlife Service (USFWS). 2002. Biological Opinion on the Application for an Incidental Take Permit for the Federally Endangered Indiana Bat (*Myotis sodalis*) for the Six

Points Road Interchange and Associated Development. Unpublished Report. Bloomington Field Office, Bloomington, Indiana. 35 pp.

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.

U.S. Fish and Wildlife Service. 2009. Indiana Bat (*Myotis sodalis*) 5-year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Midwest Region, Bloomington, Indiana. 44 pp.

Whitaker, J.O., Jr. and V. Brack, Jr. 2002. Distribution and summer ecology in Indiana. Pp. 48-54 *in* A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

Wibbelt G, Kurth A, Hellmann D, Weishaar M, Barlow A, Veith M, et al. White-nose syndrome fungus (*Geomyces destructans*) in bats, Europe. Emerg Infect Dis [serial on the Internet]. 2010 Aug [03-16-2011]. http://www.cdc.gov/EID/content/16/8/1237.htm

Zurcher, A. A., D. W. Sparks, and V. J. Bennett. 2010. Why the bat did not cross the road. Acta Chiropterologica, 12(2): 337–340.

Appendix A

Table B1. Project deconstruction, anticipated direct and indirect environmental consequences, and likely responses of exposed bats.

Project Element	Associated Direct and Indirect Environmental Consequences	Likely Responses of Exposed Bats/Colonies/Pops.	Is Take Reasonably Certain to Occur?
CONSTRUCTION			
Site Preparation: clearing, blasting, cutting, filling	Permanent direct loss of suitable roosting and foraging habitat in SAA (summer habitat	0,4,5,6,7,9,10,11,12	yes
grading, and surfacing for interstate, interchanges	Permanent direct loss of suitable roosting and foraging habitat in WAA (swarming habitat	0,4,5,6,7,8,12	yes
connector roads, frontage roads, and rest areas.	Variable loss/reduction of forested connectivity/travel corridors	0,4,5,6,7,9	yes
	Introduction of novel day/night-time construction noise,light, and dust (e.g., heavy equip. and blasting	0,1,3,4,5,6,7,9,10,11,12	yes
	Direct degradation of surface water quality (e.g., increased siltation/turbidity) in stream	0,6,7	no
	Direct loss and/or degradation of 20 acres of existing non-forested wetlands	0,5,6,7,	no
	Direct impacts or degradation of non-hibernacula, karst features and ground water resource	0,6	no
	Potential forest loss from borrow areas, rock quarries, and sand/gravel pits used for road material	0-7,9,10,11,12	yes
Demolition of existing bridges in SAA	Potential loss of roost sites beneath bridges	0,1,3,4,6	no
Construction of bat-friendly bridges in SAA	Potential net gain in day/night roost sites for bats	0,6,8,13,14	no
Revegetation of disturbed areas	Long-term protection against erosion, some insect production	0,6	no
Relocation of homes & businesses/Demo. of old	Addtnl. habitat loss/degradation and disturbances of bats during construction of new and demo. of old	0-7,9,10,11,12	yes
Relocation of utilities crossing over/under I-69	Additional habitat loss/degradation and disturbances of bats (e.g., powerlines	0,4,5,6,7,9,10,11,12	yes
OPERATION			
Vehicles driving on Interstate	Increased high-speed traffic through bat population centers leading to increased risk of roadkil	0,2,11,12	yes
(toll or non-toll)	Increased litter and noise/air/soil/light pollution from vehicles using I-69	0,6	no
	New and/or increased risk of accidental spills of hazardous materials occuring in action are	0,2,7,9,15	no
Stormwater diversion and retention	Degraded water quality from road runoff	0,15	no
Induced development	Degraded water quality from induced development (e.g., faulty septic systems, more NPDS dischargers	0,5,6,7,9,	no
	Habitat loss/fragmentation/degradation near hibernacula/mat.colonies from induced developmen	0-7,9,10,11,12	yes
	Induced human population growth increases risk of human visitation and vandalism at hibernacul	0,1,2,3,4,6,7,12,15	yes
High-mast lighting at interchanges and urban areas	Increased light pollution	0,5,6	no
I-69 Community Planning Grant Progam	I-69 induced growth is managed under local land-use plans designed to be protective of environmen	0-15	no
MAINTENANCE			
Annual winter applications of sal	Degradation of surface and ground water and potential reduction in aquatic insect abundance/diversit	0,5,6,7,9,	no
Annual summer mowing and herbicide use	Periodic noise, reduced vegetation and minimal reduction in insect abundance	0,1	no
Periodic resurfacing	Increased noise, night-time lighting, and dust	0,6	no
CONSERVATION MEASURES			
Purchase/protect existing forest in SAA	Permant protection of some important forest lands benefiting local maternity colonie	0,8,13,14	no
Plant and permanently protect new forest in SAA	Insures no net loss of forest habitat from direct impacts of I-69 (no mitigation of indirect impacts	0,8,13,14	no
Purchase/protect swarming habitat in WAA	Permant protection of some important forest lands benefiting local swarming/hibernating population	0,8,14	no
Plant and permanently protect new forest in WAA	Insures no net loss of forest habitat from direct impacts of I-69 (no mitigation of indirect impacts	0,8,14	no
Purchase/protection of hibernacula in WAA	Permant protection of important caves used by local hibernating population	0,8,14	no
Install gates and signs at hibernacula in WAA	Reduces risk of unauthorized visitation/disturbance/vandalism of hibernacula and hibernating bat	0,8,14	no
Conduct additional bat research and monitoring	Knowledge gained will improve current management of hibernacula and maternity habita	0,8,13,14	no
Protective fencing put beneath bridge/roost site	Reduced incidence of vandalism and human disturbance	0,8,13,14	no
Wetland mitigation and Wetland MOU	Insures no net loss of wetlands from direct impacts from I-69 (no mitigation of indirect impacts	0,8,13,14	no
Karst studies and implementation of Karst MOU	Insures protection of sensitive karst resources	0,8,13,14	no
Creation of educational materials and displays	Increased protection of Indiana bats stemming from impoved public awareness/educatio	0,8,13,14	no
GIS data made available to public and agencies	Greater awareness/protection of sensitive resources identified during I-69 planning	0,8,13,14	no

Key

0. no response
1. startled: increased respiration/heart rate
2. death/injury of adults and/or offspring
3. flees from roost during daylight / ↑predation risk
4. abandons roost site(s)
5. abandons foraging areas
6. shifts focal roosting and/or foraging areas
7. ↑ energy expenditures / ↓ fitness (short-term)
8. ↓ energy expenditures / ↑ fitness (long-term)
9. aborted pregnancy/repro. failure
10. ↑torpor, delayed development/partuition, and/or delayed sexual maturation of offspring
11. short-term ↓ colony reproductive rate (3-4 seasons)
12. short-term↓ in colony/hibernaculum size (3-4 seasons)
13. long-term ↑ colony reproductive rat
14. long-term ↑ in colony/hibernaculum size/fitness level
15. long-term↓ in colony/hibernaculum size/fitness leve

n/a not applicable

Table B2. Updated Impacts to Tree Cover in the Summer and Winter Action Areas (bold font indicates higher levels of concern; shading indicates updated information).

Area Name	Existing Amount of Tree Cover[1] (acres)	Current % of Tree Cover	Updated (Sec. 1-4) Direct Loss of Tree Cover (acres)	Net change since Tier 1	Indirect Loss of Tree Cover (acres)	Sum of I-69 related Losses to Tree Cover (acres)	% of Tree Cover after I-69	Net Loss in Existing Tree Cover caused by I-69	Estimated Cumulative Loss of Tree Cover (acres)	Total Loss of Tree Cover from I-69 and Cumulative Impacts by 2030 (acres)	Total % Tree Cover Left after I-69 and Cumulative Impacts by 2030[2]	Net Decrease in % Tree Cover by 2030
Source:	Tier 1 BA Addendum Table 7 and Tier 2 BAs if applicable					calculated	calculated	calculated	BAA T- 7/Tier 2 BA	calculated	calculated	calculated
Pigeon Creek	1,944	**15.5%**	10	-19	1	11	15.4%	0.1%	279	290	**13.2%**	**2.3%**
Patoka River	3,982	31.7%	20	1	0	20	31.5%	0.2%	24	44	31.3%	0.4%
Flat Creek[7]	5,426	43.2%	76	-16	0	76	42.6%	0.6%	6	82	42.5%	0.7%
East Fork	3,116	**24.8%**	42	-8	0	42	24.5%	0.3%	5	47	24.4%	0.4%
Veale Creek	2,437	**19.4%**	20	0	2	22	19.2%	0.2%	6	28	**19.2%**	0.2%
West Fork (Elnora)	1,319	**10.5%**	0	-3	1	1	10.5%	0.0%	25	26	**10.3%**	0.2%
Doans Creek	8,099	64.5%	84	-11	3	87	63.8%	0.7%	3	90	63.7%	0.7%
Plummer Creek	8,550	68.0%	**207**	**14**	1	208	66.4%	**1.7%**	5	213	66.3%	1.7%
Little Clifty Branch[8]	8,825	70.2%	252		8	260	68.2%	2.1%	16	276	68.0%	2.2%
Indian Creek	7,549	60.1%	**315**	**-44**	9	324	57.5%	**2.6%**	26	350	57.3%	2.8%
W. Fork (Bryant Creek)	4,710	37.5%	107		0	107	36.6%	0.9%	4	111	36.6%	0.9%
W. Fork (Clear Creek)	5,375	42.8%	99		0	99	42.0%	0.8%	26	125	41.8%	1.0%
W. Fork (Crooked Creek)	3,722	**29.6%**	**170**		0	170	28.3%	**1.4%**	44	214	**27.9%**	**1.7%**
W. Fork (Pleasant Run)	2,276	**18.1%**	29		4	33	17.8%	0.3%	83	116	**17.2%**	0.9%
Totals[6]:	67,330		1,402	-86	29	1,431			552	1,983		
Averages:	4,809.3	38.3%	102.2		2.1	104.3	37.4%	0.8%	39.4	143.7	37.1%	1.2%
Expanded Remaining Summer Action Area[4] (excluding WAA overlap)	102,963	29.5%	777		58	835	29.3%	0.2%	798	1,633	29.1%	0.5%
Expanded Winter Action Area[5]	146,725	60.4%	1,234		70	1,304	59.9%	0.5%	920	2,224	59.5%	0.9%

1. 12,566 acres in a 2.5-mile radius circle.
2. proposed forest mitigation acreages or other potential gains in forest have not been included here.
3. This relative ranking is largely based on current and predicted levels of forest habitat, connectivity of existing habitat, and proximity to rapidly developing areas.
4. A total of 348,439 acres comprise the Expanded Remaining SAA (minus the WAA overlap and maternity colony areas);

Numbers in this row are derived from Tier 1 and Tier 2 Forest Data (i.e., not "Tree Cover"). Sections 1,5,and 6 do not have "Expanded" remaining SAA forest acreage calculated, so Tier 1 info was used.

5. A total of 242,723 acres comprise the collective Expanded Winter Action Area; acreages for the Expanded WAA are in Tree Cover.
6. Overlap areas for four maternity colonies have been subtracted from the direct forest impact totals; there may be very minimal double-counting in the cumulative impacts total due to these overlap areas.
7. The interchange in the Flat Creek maternity area is no longer proposed, so indirect impacts have been reduced in Tier 2.
8. Little Clifty Branch is a new maternity colony; the habitat impacts in the area of this colony were already accounted for in Tier 1, but are now addressed at the maternity colony level instead of part of the Remaining Summer Action Area.

Table B3. Summary of impacts to Indiana bat maternity colonies (n=14) along I-69. (Updated February 2011)

Colony Name	Percent of the MA* that is currently tree covered/ forested	Percent of existing tree cover that is "core forest"	Size of the biggest, connected forest patch within the MA (acres)	In general, how well connected are all the existing forest patches in the MA?	In general, how well connected are the existing patches of Core Forest in the MA?	What is the FWS's overall perceived adequacy of this colony's current habitat?	How much tree cover will be lost to direct/ indirect/ cumulative impacts? (acres)	Will I-69 run through the center of a known or likely roosting area within the MA?	Will any of the identified roosts (n=36) be directly destroyed by I-69?	Is it likely that a primary roost tree(s) will be directly lost?	Is it likely that a primary roost tree(s) will be indirectly lost?	Is a proposed interchange within the MA? If so, is it near the center of the MA?	Once I-69 is operational, are most forested areas in the MA likely to remain for another 50 years?	Is this colony likely to persist into the reasonably foreseeable future once I-69 and forest mitigation are done?	If displaced by I-69 &/or other development, is additional maternity habitat available nearby?
Pigeon Creek	15%	7%	1,139	POOR	FAIR	FAIR	10 / 1 / 279	NO	NO	NO	NO	YES/NO	UNCERTAIN	YES	YES
Patoka River	32%	17%	3,855	GOOD	GOOD	GOOD	20 / 0 / 24	NO	NO	NO	NO	NO	YES	YES	YES
Flat Creek	43%	34%	5,385	GOOD	GOOD	GOOD	76 / 0 / 6	NO	NO	UNK.	NO	NO	YES	YES	YES
East Fork	25%	7%	1,748	FAIR	POOR	FAIR	42 / 0 / 5	NO	NO	UNK.	NO	NO	YES	YES	YES
Veale Creek	19%	6%	1,423	FAIR	FAIR	FAIR	20 / 2 / 6	VERY CLOSE	NO	NO	NO	YES/NO	YES	YES	YES
West Fork (Elnora)	10%	2%	303	GOOD	FAIR	FAIR	0 / 1 / 25	NO	NO	NO	NO	YES/NO	YES	YES	YES
Doans Creek	64%	33%	8,088	GOOD	GOOD	GOOD	84 / 3 / 3	NO	NO	NO	NO	NO	YES	YES	YES
Little Clifty Branch**	70%	26%	8,824	GOOD	GOOD	GOOD	252 / 8 / 16	YES	UNCERTAIN	YES	NO	YES/YES	YES	YES	YES
Plummer Creek	68%	34%	8,542	GOOD	GOOD	GOOD	207 / 1 / 5	NO	NO	NO	NO	NO	YES	YES	YES
Indian Creek	60%	22%	7,540	GOOD	GOOD	GOOD	315 / 9 / 26	CLOSE	NO	UNK.	NO	YES/NO	YES	YES	YES
W. Fork (Bryant Creek)	37%	18%	4,091	GOOD	GOOD	GOOD	107 / 0 / 4	NO	NO	NO	NO	YES/NO	YES	YES	YES
W. Fork (Clear Creek)	43%	18%	4,944	GOOD	GOOD	GOOD	99 / 0 / 26	YES	NO	UNK.	NO	YES/NO	YES	YES	YES
W. Fork (Crooked Creek)	30%	9%	3,046	GOOD	POOR	FAIR	170 / 0 / 44	NO	NO	NO	NO	NO	YES	YES	YES
W. Fork (Pleasant Run)	18%	2%	1,533	FAIR	POOR	FAIR	29 / 4 / 83	NO	NO	NO	NO	YES/NO	UNCERTAIN	YES	YES

* MA = maternity area

** New maternity colony found in 2010

Table B4. Updated Estimated levels of Incidental Take by stressor for Indiana bats during the Summer (2011).

Relevant Stressors to Bats in SAA (estimated through year 2030)	Estimated Amount or Area under Stress	FEMALE AND JUVENILE BATS IN MATERNITY COLONY AREAS (160 bats/colony/year)																													MALES						
		Pigeon Creek		Patoka River		Flat Creek		East Fork		Veale Creek		W. Fork (Elnora)		Doans Creek		Plummer Creek		Little Clifty Branch[4]		Indian Creek		W. Fork (Bryant Creek)		W. Fork (Clear Creek)		W. Fork (Crooked Creek)		W. Fork (Pleasant Run)		Take Subtotal	In WAA in summer		In remaining SAA		Take Subtotal	Total Take	Likely Form(s) of Take[3]
		E[1]	T[2]	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T		E	T	E	T			
I-69 Direct Impacts/Loss of <u>Roosting</u> Habitat (seasonal cutting restrictions observed so no direct killing anticipated)	1992 ac.	80	2	60	2	80	4	120	2	80	2	0	0	40	2	60	4	160	6	160	10	40	2	160	2	160	10	80	2	50	210	0	66	0	0	50	h
I-69 Direct Impact/Loss of <u>Foraging</u> Habitat/<u>Connectivity</u>	1992 ac.	80	2	60	2	80	1	120	2	60	2	0	0	40	0	60	1	160	2	160	4	40	0	160	1	160	2	80	0	19	210	3	66	1	4	23	h
Construction <u>Noise</u>/Vibrations causing bats to stress and flee roosts, ↑ risk of predation (while bats are present in adjacent areas)	-	80	1	60	1	160	2	120	2	160	3	0	0	40	1	60	1	160	2	160	2	40	0	160	1	160	2	80	1	19	210	3	66	1	4	23	H
Disturbance & Habitat Loss associated w/ Demolition and Relocation of 390 Homes & 76 Businesses (no timing restrictions)	unk.																													40					5	45	H,w,k,h
Habitat loss from I-69 related Utility Relocations (seasonal restrictions will be in place so no direct mortality expected)[5]	Approx. 30 ac. total for Sec. 1-4	0	0	80	0	80	0	80	0	80	0	0	0	80	1	80	1	80	1	80	1	80	1	80	1	80	1	80	1	8	15	0	20	0	0	8	H,w,h
Additional High-speed traffic / Roadkill (total roadkill/maternity colony from 2013 through 2030)	5% risk over 17 years	160	8	160	8	160	8	160	8	160	8	0	0	160	8	160	8	160	8	160	8	160	8	160	8	160	8	160	8	104	420	21	132	10	31	135	k
I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)	29 ac. in MAs	40	1	20	0	80	1	0	0	80	1	0	0	60	1	80	1	80	3	80	3	0	0	0	0	0	0	80	2	13	24	1	11	1	2	15	H,w,k,h
Increased levels of Disturbance/Vandalism of Roosting Bats in ungated Hibernacula during the summer	unk.																													0	500	5	0	0	5	5	H, w, k
TOTAL of Direct and Indirect from I-69			14		13		16		14		16		0		13		16		22		28		11		13		23		14	**253**		33		13	**51**	**304**	
TOTAL Cumulative Effects[6] (all sources through 2030)	552 ac in MAs	160	0	160	0	160	0	120	0	160	0	160	0	60	0	160	0	160	2	160	2	160	0	160	2	160	4	160	8	**18**	130	2	58	2	4	**22**	H,w,k,h
TOTALS Direct and Indirect + Cumulative			14		13		16		14		16		0		13		16		24		30		11		15		27		22	**271**		35		15	**55**	**326**	

[1] E = estimated annual # of exposed bats (for colonies the maximum number exposed = 160/year; for adult males densities were used to estimate potential exposure…with 0.17 males/impacted acre in the WAA and 0.085 males/acre in the SAA; density of males exposed was adjusted using 2009 population estimates, although these numbers are expected to fluctuate some from year to year.)

[2] T = maximum estimated number of exposed bats that may be taken from 2008-2030.

[3] H = harrass, w = wound, k = kill, and h = harm, which includes significant habitat modification or degradation resulting in death, or injury by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

[4] Gray shading = New maternity colony identified in 2010

[5] Utility locations have been confirmed for Sections 1 and 3 and will not occur within the maternity colony areas for those Sections; in Section 2, approx. 4 ac. of utility impacts in scattered woodlots within Patoka, Flat Creek, and EF White River colonies will occur.

Table B5. Updated Estimated levels of Incidental Take by stressor for Indiana bats during spring, fall, and winter.

Project Phase	Relevant Stressors to Bats in WAA (estimated through year 2030)	Estimated Amount or Area of Stressor	HIBERNACULA* in WAA																								Total Take of Bats†	Likely Form(s) of Take[3]
			Buckner		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]			
			E[1]	T[2]	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T		
	I-69 Direct Impacts/Loss of Roosting Habitat (seasonal cutting restrictions observed so no direct killing anticipated)	1234 ac.	10	0	18,640	10	19,197	10	218	0	188	2	48	1	61	1	9	0	17	0	1	0	48	0	59,250	0	24	h
	I-69 Direct Impact/Loss of Foraging Habitat/Connectivity	1234 ac.	10	0	18,640	0	19,197	0	218	0	188		48		61		9		17	0	1	0	48	0	59,250	0	0	h
	Construction Noise/Vibrations causing bats to stress and flee roosts, ↑ risk of predation (while bats are present in adjacent areas)	1234 ac.	10	0	18,640	0	19,197	0	218	0	188		48		61		9		17	0	1	0	48	0	59,250	0	0	H
	Disturbance & Habitat Loss from Demo. & Relocation of 390 Homes & 76 Businesses	unk.																									15	H,w,k,h
	Habitat loss from I-69 related Utility Relocations (no restrictions/bats present)	unk.	10	0	18,640	0	19,197	0	218	0	188	0	48	0	61	0	9	0	17	0	1	0	48	0	59,250	0	0	H,w,k,h
	Additional High-speed traffic / Roadkill (total from 2013 through 2030)	.25% risk over 17 years	10	0	18,640	47	19,197	48	218	1	188	0	48	0	61	0	9	0	17	0	1	0	48	0	59,250	148	244	k
	I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)	70 ac.	10	0	18,640	0	19,197	0	218	0	188		48		61		9		17	0	1	0	48	0	59,250	1	1	H,w,k,h
	Increased risk levels of Winter Disturbance/Vandalism of Hibernating Bats in vulnerable Hibernacula[4]	1% increase in risk	10	0	18,640	0**	19,197	0**	218	2	188	2	48	0	61	1	9	0	17	0	1	0	48	0	59,250	593	599	H, w, k
	TOTAL of Direct and Indirect from I-69			0		57		58		3		4		2		2		0		0		0		1		742	**883**	
	Cumulative Effects of Winter Disturbance/Vandalism of Hibernating Bats in vulnerable Hibernacula	1% over the span of 20+ years	10	1	18,640	0	19,197	0	218	2	188	1	48	1	61	1	9	0	17	0	1	0	48	0	59,250	593	599	H, w, k
	Cumulative Effects of ongoing Roadkill (total roadkill/hibernating pop. from 2013 through 2030)	.25% risk over 17 years	10	0	18,640	47	19,197	48	218	1	188	0	48	0	61	0	9	0	17	0	1	0	48	0	59,250	148	244	H, w, k
	Cumulative Effects of Forest Habitat Loss/Degradation, surrounding Hibernacula associated (through 2030)	920 ac.	10	1	18,640	10	19,197	19	218	16	188	26	48	7	61	10	9	0	17	5	1	1	48	2	59,250	11	108	H,w,k,h
	TOTAL of Cumulative			2		57		67		19		27		8		11		0		5		1		2		752	**950**	
	TOTALS Direct and Indirect + Cumulative			2		113		125		22		31		10		13		0		5		1		3		1,493	**1,833**	

* [redacted] and [redacted] caves were not included as they did not contain winter populations in 2009. Similarly, [redacted] Cave was not included as it was not analyzed in the BA Addendum since it was recently found and only contained 1 Indiana bat.

** Based on a signed letter of intent to place a permanent conservation easement on property, these caves are no longer considered vulnerable to human disturbance

† We are assuming that half of the take would involve adult males and half adult females (i.e., 50:50 sex ratio and no sexual bias in probability of occurrence).

1 E = estimated annual # of exposed bats (used revised winter 2009 population numbers for each hibernaculum based on 2011 photoanalysis)

2 T = maximum estimated number of exposed bats that may be taken from 2008-2030.

3 H = harrass, w = wound, k = kill, and h = harm, which includes significant habitat modification or degradation resulting in death, or injury by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

4 Assumes worst-case scenario that cave owners will not allow their vulnerable caves to be gated.

Amendment 2 to the Tier 1 Revised Programmatic Biological Opinion (dated August 24, 2006, previously amended May 25, 2011) for the I-69, Evansville to Indianapolis, Indiana highway.
July 24, 2013

This document has been prepared for the I-69 Evansville to Indianapolis Project. The Federal Highway Administration (FHWA) has used a tiered environmental review process for this project. The U.S. Fish and Wildlife Service (USFWS) issued a Tier 1 Biological Opinion (BO) in December of 2003, and shortly afterward FHWA issued the Tier 1 Final Environmental Impact Statement (FEIS). FHWA issued a Tier 1 Record of Decision (ROD) on March 24, 2004, and then initiated Tier 2 EISs for each of the six sections of the approved corridor (known as I-69 Sections 1 through 6).

The USFWS issued a revised Tier 1 BO in August of 2006 for the entire corridor. The revised Tier 1 BO requires a separate BO for each of the six sections of the project. Tier 2 BOs have been issued for Section 1 (August 29, 2007), Section 2 (February 17, 2010), Section 3 (October 21, 2009), and Section 4 (July 6, 2011). INDOT submitted a Tier 2 Biological Assessment (BA) on December 19, 2012 for Section 5 of the Project. Consultation on the entire corridor was reinitiated in 2011 in order to update baseline information (including new maternity colony data and White Nose Syndrome information), as well as, the impact analysis for Cave, which is designated Critical Habitat for the Indiana bat. Consultation on the entire corridor has once again been reinitiated for the reasons discussed below. The USFWS has prepared this new Amendment (to be referred to as Amendment 2) to the August 2006 Revised Programmatic Tier 1 BO (RPBO).

New Information/Need for Reinitiation

New Indiana bat maternity colonies discovered

As stated in the Section 5 Tier 2 BA, Indiana bat presence surveys done in 2012 captured a pregnant female Indiana bat in the Section 5 project area. Radio-telemetry showed this bat roosting in two snags. Roost tree emergence counts indicated that these snags were primary maternity roosts. As recommended by the USFWS, FHWA and INDOT established the Lambs Creek Maternity Colony at this location which is west of Martinsville. In addition to the bat surveys that were completed for I-69, the USFWS conducted a bat survey for the Sycamore Land Trust at the Beanblossom Bottoms Nature Preserve just north of Bloomington, Indiana. Three Indiana bats were captured and tracked to three different roosts, including a primary roost. The USFWS has also recommended this colony be included as the Beanblossom Bottoms Nature Preserve Maternity Colony in the Section 5 BA. The addition of these two new maternity colonies in Section 5 brings the entire I-69 total to 16 Indiana bat maternity colonies along the project corridor.

Additional forest and wetland impacts anticipated

Exempted levels of take in the form of forest and wetlands were developed in Tier 1 based on right-of-way impact estimates at that time. These exempted levels of take were included in the

Tier 1 Revised BO and the recent Amendment to the Tier 1 Revised BO. Based on more up-to-date information on project impacts and resources, some of these exempted levels are being approached or exceeded. Tier 1 exempted level of take for total forest in Section 5 is 303 acres. It is estimated that an additional 75 acres of forest impacts may occur because of utility relocations in Section 5, and another 15 acres of forest impacts due to billboard relocations. While these types of activities were expected to occur in each section, most of the relocation activity up through Section 4 was minimal and fell within the estimated forest impacts for each section. Because Section 5 involves the upgrade of an existing four-lane facility where numerous billboards and utilities are already present in the right-of-way, the relocation impacts in this section are more significant and have resulted in the original forest impact estimates for that section being exceeded. The FHWA and INDOT have requested an increase in the exempted level of take for Section 5. The new estimated take is 350 acres of total forest impacts (this includes forested wetlands) in order to account for the uncertainty related to future utility impacts.

Furthermore, there are five hibernacula whose surrounding forest habitat may be impacted by the roadway and/or relocations in Section 5 beyond what was estimated during the Tier 1 consultation, and one that falls within Section 4. Even though a 10% overage was allowed per the reinitiation criteria, this may also be exceeded for these five caves. For this reason, the INDOT and FHWA have requested an increase in the exempted level of habitat impacts for the following hibernacula: Cave, Cave, Cave, Cave, Cave, and Cave. Note there is significant overlap in the WAA of these five hibernacula and the impacted acreage is not additive.

Hibernaculum WAA	**Tier 1 RPBO Impacts** **(not including 10% buffer)**	**Tier 1 RPBO Impacts** **(including 10% buffer)**	**Current Estimated Impacts**	**New Requested Level of Take**
	288 ac	316.8	293.87 ac	305 ac
	97 ac	106.7	111.5 ac	125 ac
	98 ac	107.8	99.26	110 ac
	238 ac	261.8	262.01 ac	275 ac
	51 ac	56.1	57.03 ac	70 ac
	85 ac	93.5	84.26 ac	95 ac

* Cave is located in the Section 4 Action Area

Table 1. Comparison of Tier 1 exempted habitat impact estimates, current habitat impact estimates, and new requested levels of impact for hibernacula in the WAA. Shading indicates that current estimated impacts will exceed the Tier 1 estimate + 10% overage allowance.

In addition to forest impacts, some unanticipated non-forested wetland impacts have occurred over the span of the project, pushing the projected estimate beyond that which was established in the Revised Tier 1 BO (2006). Additional impacts are primarily the result of better wetland delineation and identification in the project area during the more refined Tier 2 studies and surveys, and not a result of a changed or enlarged project footprint. Originally, the project was expected to impact no more than 20 acres non-forested wetlands. The total impacts to non-forested wetlands in Sections 1-4 is 17.1 acres. Section 5 is currently estimated to impact 4.6 acres and Section 6 another 6 acres, bringing the total to just over 27 acres. The FHWA and

INDOT have requested the exempted level of take of non-forested wetlands be increased to 30 acres for the project as a whole.

Private Landowner Clearing along Right of Way

Finally, additional forest impacts within and adjacent to the ROW have occurred as a result of private landowners cutting and selling their timber prior to the INDOT purchasing the properties for construction of the highway. This action was presumably fostered by an economic incentive to gain the most value out of their property based on perceived INDOT appraisal and compensation procedures.

While this unintended activity has already occurred, part of the new jeopardy analysis for this reinitiation of consultation on Tier 1 of the project will consider the impacts this activity has had on the Indiana bat. The following impacts are only estimates and believed to be a worst-case scenario. It is important to note that these numbers were not verified in the field due to private property access limitations. Approximately 360 acres of habitat was selectively timbered by private landowners whose property fell within the project right of way, prior to INDOT purchasing the land. Another 35 acres was clear-cut. Furthermore, nearly 1,200 acres were selectively cut, and 95 acres clear-cut, adjacent to the right of way. From the information we have, most of this timbering occurred during the time period when Indiana bats are known to be present in the area.

As a result of this activity, FHWA and INDOT have developed a new conservation measure (item 16 under Context Sensitive Solutions in Appendix D) which will be part of their official Proposed Action for the I-69 project. The goal of the measure is to avoid and minimize impacts from private landowner harvests by working with property owners within the right of way who plan to harvest their property. FHWA and INDOT propose to develop an voluntary agreement with the interested landowners, such as a "right of entry" agreement or other type of covenant, to pay the landowner to limit the time of year in which they harvest their property; this time period would be limited to the late fall and winter when Indiana bats are not present in the forested areas. Since conservation measures are part of the Proposed Action, their implementation is required under the terms of the consultation (Tier 1 RPBO, page 16).

No additional impacts to the bald eagle (*Haliaeetus leucocephalus*), eastern fanshell mussel (*Cyprogenia stegaria*), or Cave (Critical Habitat for the Indiana bat) have occurred as a result of these additional forest habitat impacts. Our previous conclusions of "not likely to adversely affect" for the eastern fanshell mussel, "no jeopardy" for the bald eagle, and "not likely to adversely modify" for Cave, are still valid.

Status of the Species

Rangewide Update

Since the completion of the first amendment to the Tier 1 RPBO in 2011, new species information and population data are available. Although this type of information continues to be updated via the Tier 2 consultation process for each project section, following is a brief summary of the most recent information available and the current status of the species.

The USFWS BFO has collated the most recent population data gathered during 2013 biennial winter hibernacula surveys throughout the range. This draft information represents the best available data at this time and includes population information for a newly discovered hibernacula which has resulted in the addition of over 120,000 Indiana bats to the population estimate. Based on these surveys, it was determined that the Indiana bat's 2013 range-wide population stands at approximately 541,211 bats, which is a slight decrease over the 2011 range-wide population estimate of 542,470 [and a decrease from the 2009 estimate of 537,841 bats (USFWS, unpublished data, 2013). Prior to 2009, the range-wide, biennial population estimates had been increasing since at least 2001, indicating that the species' long-term decline had been, at least temporarily, arrested and likely reversed (USFWS, unpublished data, 2010). The observed range-wide decline in 2009 is partly attributable to the recently described disease dubbed White-Nose Syndrome, especially for decreased population estimates in the Northeast. In 2013, just over 40% of the range-wide population hibernated in caves within the bat's namesake state of Indiana. The species' range-wide, regional, state, and hibernacula-specific population trends are being closely monitored by the BFO.

Given the 2013 range-wide Indiana bat population estimate of 541,211, we assume that there are approximately 3,382 to 4,510 maternity colonies throughout the species' entire range [assuming a 50:50 sex ratio (Humphrey et al. 1977) with an average maternity colony size of 60 to 80 adult females (Whitaker and Brack 2002)]. As of publication of the Indiana Bat Draft Recovery Plan (Service 2007), we have records of 269 maternity colonies in 16 states that are considered locally extant. Based on the assumptions above, these colonies represent only 6% to 8% of the assumed number of maternity colonies in existence.

Recovery Unit Population Update

The Service's proposed delineation of Recovery Units (RUs) relied on a combination of preliminary evidence of population discreteness and genetic differentiation, differences in population trends, and broad-level differences in macro-habitats and land use (USFWS 2007). The Indiana Bat Draft Recovery Plan proposes four RUs for the species: Ozark-Central, Midwest, Appalachian Mountains, and Northeast (USFWS 2007). The proposed project lies entirely within the Midwest RU. The 2013 Indiana bat population estimate for the Midwest RU was 309,040. This was an increase from the 2011 estimate (308,324), as well as an increase from 2009 (281,977). Over the last 10 years the Midwest Recovery Unit has seen an overall increase in the Indiana bat population although the onset of WNS in the Midwest Recovery Unit is expected to slow or reverse that trend.

Indiana Bat Status in Indiana

Historic hibernating population levels in Indiana were comprehensive enough to estimate on a statewide level for the first time in 1981, resulting in an estimate of 151,676 hibernating bats (USFWS, unpublished data, 2010). Since that time, the statewide estimate fell to a low of 104,680 bats in 1985 and then rose steadily until the 2007 survey when it reached 238,068 bats. In 2011, the state-wide population was estimated to be approximately 225,477. In 2009, survey data indicated 213,244 bats hibernated in the state; both years represent a decrease based on 2007. The most recent survey data for Indiana indicates approximately 226,365 bats are hibernating in the state. In 2013, Indiana's 37 hibernacula harbored approximately 41% of the range-wide population of Indiana bats and approximately 73% of the Midwest Recovery Unit population. The State's two most populous Indiana bat hibernacula are Cave (n=58,886 bats in 2013) and Cave (n=56,803 bats in 2013), which are both located in southern Indiana approximately 70 miles from the I-69 project corridor. Cave is a close third with 49,617 hibernating bats reported this season. Cave is located in the WAA for the I-69 project. The status of Indiana bats in Indiana greatly influences the status of the species within the Midwest RU and rangewide.

New Threats: Update on WNS and Wind Turbines

Recently a new threat has emerged with serious implications for the well-being of North American bats, including the Indiana bat. White-Nose Syndrome was first documented in a photograph taken in a New York cave in February 2006. Since that time, sites in 22 states (New York, Massachusetts, Delaware, Vermont, New Hampshire, Maine, Connecticut, Virginia, West Virginia, Pennsylvania, New Jersey, Maryland, Missouri, Tennessee, North Carolina, Indiana, Ohio, Alabama, Georgia, Illinois, South Carolina, and Kentucky) and five Canadian provinces (Ontario, Quebec, Prince Edward Island, Nova Scotia, and New Brunswick) have been documented with WNS, including over 50 known Indiana bat hibernacula (Figure 1). The fungus that causes WNS, *Geomyces destructans*, has also been confirmed in Oklahoma and Iowa. In some affected hibernacula in New York and New England, 90 to 100 percent of the bats have died. Some scientists estimate that WNS has killed more than 5.7 million hibernating bats. The Northeast Recovery Unit population of Indiana bats suffered an approximate 70% decline (loss of at least 37,703 bats, primarily in New York) between 2007 and 2011 (USFWS unpublished data 2012) much of which is attributed to WNS.

Within the U.S., WNS has been confirmed in the Indiana bat, little brown bat, small-footed bat, northern long-eared bat, southeastern bat, tricolored bat and big brown bat. The *G. destructans* fungus has also been detected on two additional bat species: gray bats and cave myotis.

WNS has been documented in all four recovery units (RUs). The Midwest RU is comprised of the states of Indiana, Kentucky, Ohio and portions of Alabama, Georgia, Michigan and Tennessee. To date, Michigan is the only state in the Midwest RU that has not been found to have WNS. Although WNS has been present in the state of Indiana for the past three winters, Indiana's hibernating population of Indiana bats has remained fairly steady between 2009 and 2013.

There are many factors regarding WNS that remain unknown including if there are species' and/or regional differences in susceptibility and mortality rates, how long symptoms may take to manifest, and the long-term population effects. Meanwhile, the Service, States and multiple researchers are continuing to learn more about the disease and options for minimizing its spread and impacts. We believe the disease will continue to spread throughout the regions within the next several winters, with some level of mortality continuing to occur. For more information on WNS see: http://whitenosesyndrome.org/.

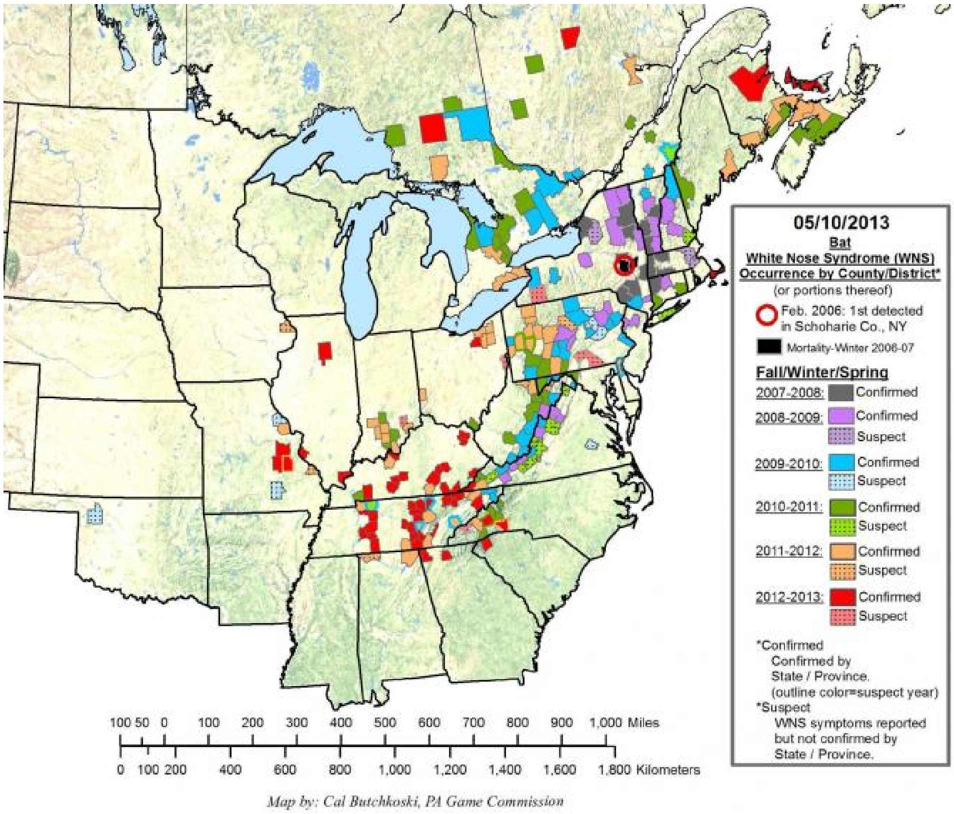

Figure 1. Geographic Distribution of White Nose Syndrome as of May 10, 2013 (www.whitenosesyndrome.org website accessed 07-09-2013).

Lastly, there is growing concern that Indiana bats (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Until the fall of 2009, no known mortality of an Indiana bat had been associated with the operation of a wind turbine/farm. The first documented wind-turbine mortality event occurred during the fall migration period in 2009 at a wind farm in Benton County, Indiana. Since that time, one additional Indiana bat mortality has been documented. The Service is now working with wind farm operators to avoid and minimize incidental take of bats and assess the magnitude of the threat. There are no known wind farms within the I-69 project area. For more information see http://www.fws.gov/habitatconservation/wind.html.

Action Area

The proposed project involves the construction, operation, and maintenance of an Interstate highway, I-69, from Indianapolis to Evansville, through southwestern Indiana. The "Action Area" is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. For Tier 1, the FHWA, INDOT, and the Service's BFO agreed to break the Action Area down into two seasonally based "sub-" action areas for the purpose of analyzing impacts to the

Indiana bat. These areas include a summer impact area, referred to as the Summer Action Area, and a winter impact area, referred to as the Winter Action Area (WAA). The Tier 1 RPBO (pg. 32) specifically defines these areas and is hereby incorporated by reference. These two impact areas combined comprise the project's Action Area. Due to the more detailed analysis recently completed on Section 5 indirect impacts, the WAA has been expanded by an additional 2,761 acres to include induced growth TAZs (traffic analysis zones) that now touch the boundaries of the WAA (see Figures 18 and 27 in Section 5 BA). This additional acreage will be addressed in the Tier 2 BA and BO for Section 5 and is not a reflection of a change in the amount of indirect impacts, but rather the distribution of the indirect impacts within the Action Area.

Environmental Baseline

Status of the Species in the Action Area

Maternity Colonies

New Colonies

As mentioned above, two new Indiana bat maternity colonies were discovered this past summer. A new Indiana bat presence survey was completed May - June 2012 in Section 5. This survey effort was conducted to update the Indiana bat presence status within the Section 5 action area due to the amount of time elapsed since the original surveys which were completed in 2004/2005. A total of twelve Indiana bats were captured, five of which were radio-tagged. All of these bats were tracked successfully to a roost tree. Three of the trees were determined to be primary roosts based on the emergence counts. One roost (927-1) was within the previously identified West Fork (Bryant Creek) Maternity Colony and showed a maximum emergence count of 74 bats; the remaining two (768-1 and 768-2) were outside of any existing known colony. Tree 768-1was a dead eastern cottonwood and had an emergence count between 29 and 80 bats. This tree was located 1.1 miles from the proposed corridor. It was classified as a primary roost since the emergence count was above 30. The second roost tree was a dead American elm (768-2). This tree had an emergence count between 1 and 43 and was 2.6 miles from the corridor. Based on the discovery of these primary roost trees, it has been determined that an additional maternity colony is present within the Section 5 action area. This new colony is called the Lambs Creek Colony.

In addition to the bat surveys that were completed by INDOT for I-69, the USFWS Bloomington, Indiana Field Office conducted a bat survey for the Sycamore Land Trust at the Beanblossom Bottoms Nature Preserve in Monroe County. We caught three Indiana bats that were tracked to one primary roost and two secondary roosts. Based on the location of this new maternity colony in the project Action Area, we requested that this colony (Beanblossom Bottoms Nature Preserve Colony) be considered in the Section 7 consultation process for this project. This brings the total to 16 known Indiana bat maternity colonies within the I-69 Action Area.

Survey Updates

Since the first amendment to the Tier 1 RPBO was completed in May 2011, additional bat surveys have been conducted in several of the other project sections as part of the pre- and post-construction survey requirements. The third year of construction monitoring for Section 1 was conducted from 19 May to 11 June 2011. A total of four sites yielded forty-five bats belonging to 6 species: 11 evening bats, 10 eastern red bats, 10 big brown bats, 9 eastern pipistrelles, 3 northern bats (Myotis septentrionalis), and 2 little brown bats (Myotis lucifugus); no Indiana bats were caught. In 2012 surveys were again conducted and three Indiana bats were captured and radio-tracked in Section 1. An adult male was tracked to several secondary roosts, and one female was tracked to a primary roost containing over 130 bats. Both roosts were west of the new alignment, on the eastern edge of the existing Pigeon Creek Colony.

The first year of construction monitoring for Section 2 was conducted from 24 May to 2 August 2011. A total of 10 sites yielded one hundred and twenty-seven bats belonging to 7 species: 49 eastern pipistrelles, 46 eastern red bats, 10 little brown bats, 8 big brown bats, 7 northern bats, 4 evening bats, and 3 pregnant Indiana bats. Radio-transmitters were placed on all three Indiana bats. Only two of these bats were tracked to specific roost trees, one within the existing Patoka River Colony and the other in the known Flat Creek Colony; no signal was detected for the remaining Indiana bat. In 2012, two pregnant Indiana bats were netted at site 11 in Section 2. Both females were found to be roosting in various trees within the existing Patoka River Maternity Colony area, including roosting together in a primary roost. These roosts were in the same wetland complex as one of the 2011 roosts.

The first year of construction monitoring for Section 3 was conducted from 21 July to 9 August 2011. A total of eight sites yielded two hundred fifty-four bats belonging to 8 species: 101 little brown bats, 47 big brown bats, 30 eastern pipistrelles, 24 eastern red bats, 25 evening bats, 21 northern bats, 5 Indiana bats and a single hoary bat. All captured Indiana bats received a radio-transmitter. No signal was detected for three of the five radio-tagged bats. One Indiana bat (juvenile female) was detected in an area where biologists did not have permission to access, although it appears the bat was roosting within the known Elnora Colony area. The remaining Indiana bat (adult male) was located at four roost trees which were all large, dead cottonwood trees about ¾ mile east of the Elnora colony area. No Indiana bats were captured in Section 3 during the 2012 survey.

In 2011, one site (18) was netted in the Section 4 project area. Although 24 bats were collected, no Indiana bats were found at this site. In 2012, all 11 sites previously surveyed in 2004-2005 in Section 4 were surveyed again. Three Indiana bats were caught (one lactating female at site 11 and two males at site 23). The female was radio-tracked to a primary roost tree within the known Plummer Creek maternity colony area. The newly discovered roost tree was a dead shagbark hickory and was approximately 1.7 miles from the 2004 roost tree. The radio-tagged male bat was tracked to a dead black walnut tree and was found to be roosting with 3-4 other bats. This secondary roost tree was located in the existing Indian Creek maternity colony area.

Hibernacula Populations and Adult Males

During the 2011 reinitiation process, the most recent population estimates for local hibernacula were derived from the 2009 winter hibernacula surveys. Currently, the most up-to-date population information for the Action Area includes data from 2013 surveys. In 2009, the estimated number of Indiana bats in all the hibernacula within the Action Area was 97,688. In 2013, the estimate was 88,487 bats.   Table 1 lists the most recent population information for each hibernaculum within the I-69 Action Area. This information is also used to estimate the density of male bats within the Action Area during the summer months. Male bats continue to be netted throughout the project area during the ongoing yearly survey efforts.

Hibernacula	2013 (or most recent) Indiana bat Population
Cave	30,496 (+8,667 from 2011)^
Cave	7,849 (-17,507 from 2011)^
	218 (2009)
	48 (2009)
	31 (-156 from 2009)
Cave	58 (+48 from 2009)
Cave	17* (-17 from 2003)
Cave	0** (same as 2003)
Cave	49,617 (+1,214 from 2011)^
Cave	0*** (-3 from 1999)
Cave	86 (+25 from 2009)
	18 (+9 from 2009)
	48 (2009)
	1 (only surveyed in 2006)
Cave	1***
*Last survey completed in 2007	
**Last survey completed in 2005; an independent visit of Cave in March 2010 showed approximately 40 Indiana bats	
***Last survey completed in 2005	
^ 2013 data	

Table 2: Updated Indiana bat Populations within Hibernacula in I-69 Action Area

Effects of the Action

Additional Forest Impacts

Although the project activities and footprint are essentially unchanged, several additional forest impacts are anticipated. Impacts associated with the need for utility and billboard relocations were not independently analyzed in the Revised Tier 1 BO (2006). While these activities were expected to occur in each section, most of the relocation activity to date (Sections 1- 4) has been minimal and has fallen within the acreage of forest impacts estimated as a result of construction in each section. Because Section 5 involves the upgrade of an existing four-lane facility with numerous billboards and utilities already present in the right-of-way, the relocation impacts in this section are more significant than originally anticipated and have resulted in the original forest impact estimates for that section being exceeded. It is estimated that an additional 75 acres of forest impacts may occur because of utility relocations in Section 5, and another 15 acres due to billboard relocations.

An analysis by the INDOT has determined that only a small amount of these forest impacts will occur within the known maternity colony areas in Section 5 and the WAA. For the utility impacts in the colonies, we anticipate 1.5 acres of forest impact (0.03% of available tree cover) in the Lambs Creek Maternity Colony area, 11.5 acres (0.2% of available tree cover) in the West Fork Bryant Creek Colony area, and no impacts in the Beanblossom Bottoms Nature Preserve Maternity Colony area. These impacts will likely occur on the very edge of these colony areas, away from known roosting sites, and will follow the seasonal tree-clearing restrictions, avoiding any tree removal during the maternity season. Furthermore, no billboards are anticipated to be relocated within forested areas within any of the maternity colonies. All 15 acres of potential forest impacts due to billboard relocation will be outside of the colony areas (Michelle Allen, pers. comm., 5/8/2013).

In addition to the Tier 1 exempted forest impact amount being exceeded for Section 5 overall, some of the hibernacula present in the Section 5 Action Area may have their individual WAA habitat impacted by these same utility and billboard relocations, as well as some minor right of way adjustments. An exempted amount of forest impact was developed for each hibernaculum in the WAA during the Tier 1 consultation. There are six hibernacula whose surrounding habitat may be impacted by the relocations and right of way in Section 5 beyond what was estimated during the Tier 1 consultation. Based on this, the INDOT and FHWA have requested an increase in these anticipated impact levels (see Table 1). Increases to the amount of forest habitat potentially impacted range from 12 to 37 additional acres within a hibernacula's 50,240-acre WAA, and many of these impacts overlap. Although we do not have the exact amount of forest within each hibernacula's WAA, the loss of an additional 12 to 37 acres per WAA will not adversely impact the Indiana bat. Furthermore, only two of the hibernacula with slight increases have significant use by Indiana bats (and   Caves). Both of these caves and their immediate surrounding habitat have been permanently protected via a conservation easement.

Additional Wetland Impacts

In addition to forest impacts, some unanticipated non-forested wetland impacts have occurred over the span of the project, pushing the projected project-wide estimate beyond that which was established in the Revised Tier 1 BO (2006). Originally, the project was expected to impact no more than 20 acres of non-forested wetlands. To date, the total impacts to non-forested wetlands in Sections 1-4 totals 17.1 acres. Section 5 is currently estimated to impact 4.6 acres, and Section 6 another 6 acres, bringing the project total to just over 27 acres. The additional 7 acres of impact has been spread throughout the various sections. These non-forested wetland impact amounts have increased since the Tier 1 estimate as the accuracy of the wetland determination data has improved. During Tier 1, National Wetland Inventory (NWI) wetland data was the most accurate wetland data available for the study area. The NWI data was based upon aerial imagery and not on actual field work. The Tier 2 data consists of field verified wetlands that are identified using the U.S. Army Corp of Engineers wetland criteria (hydrology, vegetation, and soils). Since the NWI data relies solely on aerial imagery it can sometimes under- or over-estimate, or misidentify, wetland areas. This difference in the resource data is the primary cause of the increase in the non-forested wetland impact acreage between Tier 1 and Tier 2. It should be noted that the **forested** wetland impacts have been substantially reduced from the Tier 1 estimates (Michelle Allen, FHWA, pers. comm., 2013). Overall, approximately 0.6% of the existing non-forested wetlands (*i.e.* emergent/scrub-shrub wetlands) will be impacted in the entire project Action Area.

We anticipate that utility and billboard relocations will likely be in the more urban areas near the existing roadway. Neither the additional forest impacts (including those in the various WAAs) nor the additional wetland impacts are likely to adversely affect any of the known maternity colonies, hibernacula, male Indiana bats, or the local hibernating/swarming populations. These impacts will result in minimal loss of habitat with no direct take anticipated due to tree-clearing restrictions. No impacts to roost trees or any displacement of Indiana bats are anticipated. Habitat impacts will be short term and habitat loss will be temporary due to established conservation measures and reforestation and restoration commitments.

Updated Maternity Colony Impacts and Analysis

As a result of an increase in the number of maternity colonies now known to occur in the action area, estimates on the number of Indiana bats exposed and adversely impacted by the project overall have been updated (see Table B4). Specific impacts to the two new colonies are analyzed individually below.

Based on our assumptions as described in the Tier 1 RPBO, each maternity colony is comprised of 80 adult females and their single offspring. This results in a maximum of 160 bats per colony by mid-June after the young are born and become volant (i.e., capable of flight) around mid-July. Therefore, given the documented presence of 16 maternity colonies in the Action Area (which includes the new Beanblossom Bottoms Nature Preserve and Lambs Creek colonies) and an approximate total of 160 females and their pups per colony, we can assume that there are a combined total of approximately 2,560 (16 x 160 = 2,560) adult females (n=1,280) and juveniles (n=1,280) within or adjacent to the Action Area during the summer active period and that varying proportions of the bats in these colonies are likely to be exposed to direct and/or indirect effects from I-69.

A discussion of the anticipated stressors and effects of the action on maternity colonies in the project area can be found in the Tier 1 RPBO and the 2011 Amendment and are hereby incorporated by reference. The anticipated project stressors and associated effects have not changed.

In order to determine the amount of take anticipated for the newly discovered Beanblossom Creek Nature Preserve and Lambs Creek colonies, the likelihood of take for each stressor was analyzed for the new colony, as was done in the Tier 1 consultation (and 2011 amendment) for the other 14 colonies. The stressors with the most potential to affect these newly discovered maternity colonies include direct loss of roosting and foraging habitat and roadkill.

<u>Beanblossom Bottoms Nature Preserve Maternity Colony Analysis</u>

Of the 255 acres of forest (including forested wetlands) that will be cleared for I-69, none fall within the 2.5-mile radius area of the Beanblossom Bottoms Nature Preserve Maternity Colony area. Impacts along this part of the project corridor were originally described and included within the Remaining SAA totals until the recent discovery of a maternity colony at this location; therefore, there are no Tier 1 colony impacts to compare to. The alignment passes through a very small, unforested portion of the colony (although there are some scattered landscape trees present). In addition, no tree cover impacts are anticipated.

In the Beanblossom Bottoms Nature Preserve maternity colony, 8,371 acres of tree cover[1] are available. Using the estimated amount of 2.3 snags per forested acre in Section 5, it is assumed that 19,253 snags are available within the colony area. Based on EEAC forest data[2], no forests will be impacted within the maternity colony by the Preferred Alternative (PA), resulting in no snags impacted within the alignment.

Connectivity to the alignment was also analyzed within the Beanblossom Bottoms Nature Preserve Maternity Colony. Connectivity to I-69 from the roost trees and capture points occurs along various tree lines as well as Beanblossom Creek and its various unnamed tributaries. The shortest connectivity routes to I-69 from the two Indiana bat capture points were approximately 4.4 miles (Site 1-B) and 4.9 miles (Site 2-B). The shortest connectivity route distances to I-69 from the two known roost trees were approximately 1.1 mile (782-1) and 4.8 miles (R-1). The shortest straight-line distance from an Indiana bat capture point to the nearest tree cover impact was 2.5 miles (Site 1-B), while the longest was approximately 2.7 miles (Site 2-B). The shortest straight-line distance from any roost tree to the nearest tree cover impact was approximately 1.0 mile (782-1), while the longest straight-line distance was approximately 2.5 miles (R-1).

Connectivity to the proposed mitigation sites was also calculated. There are five mitigation sites proposed within and adjacent to the maternity colony area which includes 168 acres of forest for preservation and 26 acres of land that will be reforested. Another 240-plus acres will be preserved and/or reforested within a mile and a half southeast of the maternity colony area. There is a roost tree (R-1) located 3.6 miles away from the proposed Modesto mitigation site and the other roost tree (782-1) is located 1.7 miles away from the proposed Chambers Pike mitigation site. Capture Site 1-B is located 3.1 miles away from the proposed Modesto mitigation site. Capture Site 2-B is located the farthest from any mitigation site at approximately 3.7 miles from the Modesto mitigation site. See Figure 2 below and Table 12 of the Section 5 Tier 2 BA for additional information.

1 Tree Cover – defined as all trees, including individual, fragmented groups of trees. Delineated from 2003 aerial photography.

2 Forest included groups of trees >1 acre and wider than 120 feet as verified by the EEAC within the corridor. This includes forested wetlands as well as upland forest.

Figure has been removed for confidentiality reasons related to the federally endangered Indiana bat (Myotis sodalis)

Figure 2. Beanblossom Bottoms Nature Preserve Maternity Colony Connectivity to the Nearest I-69 Alignment and Mitigation Sites.

The preferred I-69 alignment runs just outside the eastern edge of the Beanblossom Bottoms Nature Preserve Maternity Colony area (Figures 1 and 3). Once Section 5 of I-69 is operational, the increase in the number of fast-moving vehicles could increase the number of bats struck as they attempt to fly across the interstate at night during the summer maternity season. Considering the distance of the proposed alignment to the center of the maternity colony's use area, the lack of likely travel corridors providing connectivity to the proposed alignment (Figure 2), and juxtaposition of potential roosting and foraging habitat, capture locations, and known roost sites, it is unlikely colony members would be very susceptible to increased roadkill along the upgraded Section 5 roadway.

Because the project consists of upgrading an existing 4-lane roadway and the alignment barely falls within the maternity colony area (and has no tree cover impacts), we believe that no take will occur as a result of any construction activities, nor do we anticipate that the upgraded roadway will be a factor in how individual colony members are able to move throughout the colony area. It is doubtful that any unknown roost trees (including secondary roosts) will be affected by project construction. In the unlikely event that a roost is felled by construction activities, additional roosting and foraging habitat is available within the area.

No impacts due to construction noise/vibration are expected, as the construction activities will be short term and far removed from suitable foraging and roosting habitat.

With regard to indirect/induced impacts within the Beanblossom Bottoms Nature Preserve Maternity Colony area, minimal to no indirect growth is expected based on Traffic Analysis Zones (TAZs) along this portion of the Section 5 alignment. Further discussion related to indirect impacts can be found starting on page 94 of the Tier 2 BA for Section 5, as well as the Tier 2 Section 5 DEIS.

Overall, impacts to the Beanblossom Bottoms Nature Preserve Colony will be insignificant and discountable.

Lambs Creek Colony

The proposed alignment passes through the southeastern corner of the Lambs Creek Maternity Colony area and only about one-third (0.3) of a mile of roadway comprises the Section 5 Preferred Alignment (Figure 3). Although the Section 5 alignment ends just inside the maternity colony area, all impacts to the colony associated with the I-69 roadway are being addressed in the Section 5 BA and BO using the Section 5 Preferred Alignment and the Representative Alignment for the Section 6 portion.

The Lambs Creek Maternity colony contains approximately 5,000 acres of forest. Approximately 6 acres of forest impacts will occur within the maternity colony area (4.5 acres are within the Section 6 project area). Impacts along this portion of the project corridor were originally described and included within the Remaining SAA totals until the recent discovery of a maternity colony at this location; therefore, there are no Tier 1 colony impacts to compare to.

In the Lambs Creek maternity colony, 5,058 acres of tree cover are available. This equates to 11,633 available snags in the colony area (calculated at 2.3 snags/acre density). Based on EEAC forest data, 5.6 acres of the tree cover will be impacted within the maternity colony by the roadway. This equates to potentially 13 snags being impacted within the alignment or approximately 0.1% of all available snags in the maternity colony area.

One Indiana bat capture point and two primary roost trees have been identified within the Lambs Creek Maternity Colony. Connectivity to I-69 from the Indiana bat capture point occurs primarily along the West Fork of the White River and Indian Creek. The shortest connectivity route to I-69 from the Indiana bat capture point is 4.1 miles (Site 24). The shortest connectivity route to I-69 from the roost trees is 2.8 miles (768-1) and 4.9 miles (768-2). The shortest straight-line distance from an Indiana bat capture point to the nearest Section 5 tree cover impact is 2.3 miles (Site 24). The shortest straight-line distance from the roost trees to the nearest Section 5 tree cover impact is 1.5 miles (768-1) and 3.0 miles (768-2). The Indiana bat capture site and the two roost trees are closer to the impacts calculated from the Section 6 Representative

Alignment. The shortest distance from a tree cover impact to the Section 6 Representative Alignment is: 1.2 miles (roost 768-1); 2.7 miles (roost 768-2); and 2.1 miles (Site 24).

No impacts to the identified roost trees are anticipated. Since a four-lane interstate already occupies the preferred alignment right-of-way, it is doubtful that any unknown roost trees (including secondary roosts) will be affected by project construction. In the unlikely event that a roost is felled by construction activities, additional roosting and foraging habitat is available within the area.

Two mitigation sites (Nutter Ditch and Principal) consisting of 288 acres of upland forest preservation and 55 acres of reforestation are proposed within the Lambs Creek Maternity Colony area. Connectivity routes were calculated for both the roost tree sites, and the bat capture site, to the Nutter Ditch mitigation site. Site 24 is 1.6 miles away from the Nutter Ditch mitigation site. Roost 768-1 is approximately 0.3 miles away from the Nutter Ditch mitigation site. Roost 768-2 is approximately 2.4 miles

Figure has been removed for confidentiality reasons related to the federally endangered Indiana bat (Myotis sodalis)

Figure 3. Lambs Creek Maternity Colony Connectivity to the Nearest I-69 Alignment and Mitigation Sites.

away from the outside boundary of the Nutter Ditch mitigation site. Because the Principal site is relatively new, we do not have connectivity information, nor is it depicted on the maps. See Figure 3 above and Table 13 in the Tier 2 BA for additional information.

Based on the amount of surrounding forest habitat and stream crossing locations, bats from the Lambs Creek Colony may attempt to cross the interstate along the Indian Creek corridor. We anticipate that the I-69 span over Indian Creek will remain the same as it currently is (Michelle Allen, FHWA, pers. comm., 2013) and continue to allow bats to fly under the roadway and connect to other habitat areas east of the alignment if, in fact, they are currently using the stream corridor for that purpose.

Another potential effect of the upgraded interstate in Section 5 is the potential for increased mortality due to vehicle strikes. We believe the Tier 1 estimate for roadkill is reasonable (and very conservative) and anticipate that no more than 8 bats will be killed by vehicle collision between 2013 and 2030 within the Lambs Creek Maternity Colony, or approximately 1 bat every two years (see road-kill discussion in Tier 1 RPBO). An increase in take due to increased traffic may be negligible in this more urban area of the colony circle. Recent research suggests that bats may avoid crossing larger highways and interstates (Zurcher *et. al*., 2010; Bennett & Zurcher, 2012; and Bennett *et. al.*, 2013). The loss of a few individuals due to road-kill may cause short-term (*i.e.*, 2 to 3 years) reductions in reproductive success, but we do not anticipate an appreciable long-term change in reproductive success or viability of the Lambs Creek Maternity Colony.

Some take in the form of harassment due to construction noise/vibration may be possible (although unlikely based on the distance from the known roosts). Loud noises during the day may cause increased heart rates/respiratory rates and disturbance from the roost. This could lead to roost abandonment and/or atypical exposure to daytime predation. No impacts are anticipated to nighttime foraging activities. These construction activities will be short term and no long term affects are anticipated.

Because the Lambs Creek Maternity Colony has been only recently identified, indirect and cumulative impact analyses specific to the colony were not prepared during the Tier 1 evaluation. Recent analysis indicates minimal growth may occur in the colony area, primarily as a result of construction of the Liberty Church Road interchange. A total of 0.1 acres of forest are estimated to be indirectly impacted (*i.e.* developed) as a result of the I-69 project in this colony area.

Overall, we do not anticipate any appreciable long-term changes in reproductive success or the viability of the Lambs Creek Maternity Colony due to construction of the I-69 upgrade along existing SR 37.

<u>Summary</u>

The number of animals per colony exposed and affected by all of the various stressors is estimated based on a variety of variables including: the location of the right-of-way within the maternity colony area, amount and location of tree cover before and after construction, location of known roost trees, connectivity of remaining habitat, anticipated indirect and cumulative impacts, etc. Many of these factors are specifically discussed within the Tier 1 Biological Assessment (BA) Addendum, Tier 1 RPBO and the subsequent Tier 2 BAs. The Tier 2 BA and BO for Section 5 will address these colonies in more detail. Please refer to Table B4 in Appendix A for additional information regarding the amount of take anticipated for these colonies (note that these estimates are through the year 2030). Based on the impacts discussed above (as well as the proposed mitigation efforts) and the amount and location of existing foraging and roosting habitat, we do not anticipate the effects of the action to reduce the long-term survival or reproductive potential of these newly identified maternity colonies.

Adult Males Update (summer impacts)

Estimates of male bat density within the Action Area have been slightly adjusted since the 2011 Amendment to the Tier 1 RPBO. We estimate that half of the 88,487 bats (2013 estimate) using the hibernacula within the Action Area are males (44,244) and half of those would remain near their hibernacula during the summer reproductive season (22,122). The expanded WAA (portion of the Action Area where bats swarm and hibernate in fall and winter) consists of approximately 148,182 acres of tree cover which results in a density of male bats of 0.15 bats/acre (22,122 bats/148,182 ac. = 0.15 bats/ac). For the portion of the Action Area that extends north and south of the hibernacula area (WAA), we assume the density of adult males is 0.075 adult males per acre of forested habitat (half of the density near their hibernacula). Using these density estimates and the number of acres impacted by the project (excluding the maternity colony areas), we estimated the number of bats exposed and impacted by the project and its various stressors (see Table B4). Because the number of male bats exposed to the project impacts during the summer has slightly decreased since the 2011 Amendment, the take estimates have proportionally decreased resulting in a very small decline in estimated take of males during the summer. Note the amount is still slightly higher than the 2006 Tier 1 RPBO estimate due to increased populations since that time.

With the exception of loss due to roadkill, direct loss of males **during the summer months** due to habitat loss (direct and indirect), noise, and disturbance of summer roosting in ungated hibernacula, is expected to be minimal; only 20 male bats throughout the life of the project are estimated to be taken. The number of road-killed male bats during the summer is also low, with 26 male bats anticipated to be killed over a 17-year period once the highway is fully operational. With a portion of the take already occurring, and some occurring in small increments over a long period of time in the future, these impacts to male bats during the summer, will have no measureable impact on the Indiana bat populations to which these individuals belong.

Update on Indiana Bats within the Wintering Portion of the Action Area (WAA) during the Fall, Winter and Spring

No direct adverse impacts are anticipated to any of the 15 Indiana bat hibernacula in the Action Area, although a small amount of take (23 bats through the year 2030) is anticipated due to loss of fall roosting and swarming habitat surrounding several of the hibernacula.

Take associated with roadkill and human disturbance is based on a percentage of exposed bats (estimated in Tier 1 RPBO to be 0.25% and 1%, respectively). Based on the latest population estimates for each of the hibernaculum within the Action Area, the number of Indiana bats taken by the various stressors during the fall swarming, winter hibernation, and spring staging periods has decreased (n = 761 bats) due to an overall decrease in the local population using those hibernacula (a decrease from 97,688 in 2009 to 88,487 bats in 2013). Take associated with unauthorized visits (which is the bulk of the projected winter take) is not anticipated to occur until a significant amount of the highway is constructed and operational, facilitating access to the general area. The small amount of additional forest impacts surrounding several hibernacula in Section 5 is addressed above in the forest impact section.

To date, mitigation efforts have resulted in the permanent protection of over 3,400 acres within the winter portion of the Action Area (*i.e*. area surrounding all of the hibernacula; defined as WAA in the Tier 1 RPBO), including over 800 acres of reforestation. This area is within and near one of the core hibernacula areas in the Midwest RU. Most importantly, a permanent conservation easement has been placed on two Priority 1A Indiana bat hibernacula. This easement permanently protects and Caves and nearly 300 acres of surrounding swarming habitat. Over 38,000 Indiana bats hibernated in these two caves in 2013. Permanent protection and management of these two caves has significantly reduced the potential take associated with unauthorized disturbance and vandalism. Conservation easements have also been placed on two other small Indiana bat hibernacula in the WAA. In addition, a conservation easement has been placed on a large cave in the Action Area which underwent work last spring to remove some large boulders and debris from opening in order to restore the cave's airflow. Monitoring will determine the cave's suitability for hibernating bats, including Indiana bats. Reforestation has also occurred on the surrounding land to improve roosting and foraging habitat. Management and protection of these important hibernacula is critical for the protection, survival, and recovery of the species.

Section 4 Private Landowner Tree Clearing

Beginning in early 2011, the USFWS Bloomington Field Office (BFO) began receiving reports of private landowners cutting timber in and adjacent to the right of way in Section 4 of the I-69 project. Over time, the BFO received notification of at least 10 different parcels being logged along the preferred alignment. The INDOT eventually determined that over 35 parcels (close to 1,700 acres of forest) along the right of way had some degree of timber harvest prior to INDOT securing them for road construction. While INDOT did not condone the private landowner harvest, it appears that many property owners began contracting for timber services once project development began in the area.

In 2010, early in the Tier 2 consultation process for Section 4, the FWS discussed with INDOT whether landowners would be compensated for timber on their property. INDOT indicated that the landowners would be compensated; FWS interpreted this to mean that the landowners would be paid for their marketable timber value based on a timber appraisal. However, INDOT's approach is to pay a landowner an amount comparable to other local, forested properties in the same market. This method of appraisal and valuation is known as the comparable sales approach, and is described in INDOT's 2011 Appraisal Manual.

During the appraisal time period (primarily in 2011), we were informed that several landowners were advised to have their properties harvested prior to selling to INDOT in order to improve their financial gains. Based on this, INDOT sent letters to landowners and local timber companies informing them of the potential ESA violations and advised them to adhere to seasonal tree-clearing restrictions for the Indiana bat. Additionally, we issued, in June 2011, a letter to all property owners along the I-69 right of way informing them of the presence of the endangered Indiana bat in the project area and providing suggestions of how to avoid taking the species. For a copy of the above-reference letters, please see Appendix C of the Section 4 Tier 2 BO. Despite these efforts, some logging in the area continued.

In order to determine the extent of the private tree clearing activities along the Section 4 alignment, the FHWA, INDOT and their consultants gathered information on the location and potential amount of forest that was timbered on various properties. To do this, information was collected from aerial photography, conversations with property owners, and observations of harvesting activities and logging trucks, etc. by technical field staff working along the alignment. (In addition, biologists and law enforcement officials from local FWS field offices investigated active logging at several properties along the right of way during the summer, fall, and spring of 2011-2012). Tables 3 and 4 provide information based on the FHWA's information gathering effort. The acreage amounts listed are a maximum amount estimate, assuming that all of the forest on a particular parcel had some harvest occur. For example, if logging activity was noted on a property that was 100 acres in size, and 50 acres of that parcel was forested, it was assumed that all 50 acres of forest had some logging occur. It is important to note that these numbers were not verified in the field due to private property access limitations. The Tables show the amount of potential harvest both along the entire ROW in Section 4, and specifically within the four maternity colonies in Section 4.

Table 3. Potential Harvest Amounts on Private Property along the I-69 Right of Way.

	Number of parcels with Some Harvesting	Number of Forested Acres on Parcels with Some Harvesting	Number of Harvested Forest Acres within ROW	Number of Forested Acres Outside of ROW (Potentially Harvested)
Selective Cut	35	1,530	360	1,170
Clear-cut	3	130	35	95
Total	38	1,660	395	1,265
Note: The information on this type of harvest activity has been developed through the following methods: reviews and before/after comparisons of aerial photography dated 2005, 2008, 2010, and 2011 (via Google Earth and Bing Maps) to estimate the extent of forested acreage on the parcels, conversations with property owners, and observations of tree harvesting and logging trucks on proposed and publicly-owned right-of-way by technical field staff. In the before/after comparisons in the majority of the parcels identified as selectively harvested, there is not a significant difference between the 2005 and 2011 aerial photography. These acres were not confirmed in the field as the property is privately held.				

Table 4. Potential Harvest Amounts on Private Property within the Four Maternity Colony Areas.

Maternity Colony	Maximum Forest Acreage Potentially Cut^	Forest Acreage Cut Within ROW	Potential Forest Acreage Cut Outside of ROW
Doans Creek Selective	80	20	60
Doans Clear-cut	0	0	0
Plummer Selective	230	55	175
Plummer Clear-cut	0	0	0
Little Clifty Selective	610	125	485
Little Clifty Clear-cut	55	15	40
Indian Creek Selective	230	80	150
Indian Creek Clear-cut	65	25	40
TOTAL	1270	320	950
^The maximum forest potentially cut is a tally of all available forest in the parcels that had some amount of harvesting done. This is a worst case amount, assuming the landowner had the entire forested portion of their parcel harvested to some extent.			
Note: The information on this type of harvest activity has been developed through the following methods: reviews and before/after comparisons of aerial photography dated 2005, 2008, 2010, and 2011 (via Google Earth and Bing Maps) to estimate the extent of forested acreage on the parcels, conversations with property owners, and observations of tree harvesting and logging trucks on proposed and publicly-owned right-of-way by technical field staff. In the before/after comparisons in the majority of the parcels identified as selectively harvested, there is not a significant difference between the 2005 and 2011 aerial photography. These acres were not confirmed in the field as the property is privately held.			

Effects of the Activity

Most of the stressors associated with tree cutting and clearing (*e.g*. loss of roosting/foraging habitat, decreased habitat connectivity, degraded water quality, noise, etc.) have been previously discussed and analyzed in the Tier 1 RPBO (pg. 81) and the previous biological assessments and biological opinions for this project, and are hereby incorporated by reference. However, while tree-clearing activities completed by the INDOT were not expected to result in direct death of individual bats due to seasonal clearing restrictions, the private landowner tree-clearing activities appear to have primarily occurred during the summer maternity season and the fall swarming period. This timing significantly increases the likelihood of direct mortality due to the felling of occupied roost trees.

During the summer, most reproductive females occupy roost sites under the exfoliating bark of dead trees. Indiana bats sometimes are found under bark on large dead branches within a living tree or on a dead trunk of a living tree with multiple trunks. Living trees typically are used as alternates only when suitable dead trees are not available. Maternity colonies typically use 10 to 20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (USFWS 2007). Roost trees, although ephemeral in nature, may be occupied by a colony for a number of years until they are no longer available or suitable (USFWS 2007).

The probability of an occupied roost tree being felled during timber harvest activities is difficult to predict. Snag density is typically less in harvested forests, presumably as a result of harvest methods and activities (Wisdom, L.J. and Bate 2008; Ohmann, 2002). It is not uncommon for logging companies to remove snags for safety and access purposes, or for snags to be knocked over by equipment or falling trees (Garber et. al., 2005). This was likely the cause of a roost tree found on the ground in the project right of way in early 2011. In the summer of 2010 a primary roost tree was identified within the right of way in what is now known as the Little Clifty Branch colony. (This roost, along with a few secondary roosts, was the basis for the establishment of a colony in this location.) The following January (2011), geotechnical field crews working in the area, discovered that the roost tree was on the ground. There was no evidence that the tree had been cut down (although the top had been cut away from an access path), nor any evidence of storm damage in the area (other downed trees/branches) (pers. comm. J. Dupont, Bernardin Lochmueller and Associates, 2011). Further investigation determined that the property owner had selectively harvested the area that previous October/November (2010). While it is unlikely that the maternity colony was still using the tree in October/November, it does provide further evidence that there is a non-discountable likelihood that snags present in areas being harvested could be felled, whether intentionally or not. Depending on the timing of the harvest, it is reasonable to expect, in a worst case scenario, that an occupied roost tree could be felled in areas with known maternity colonies.

The amount of tree harvest that occurred within each known 2.5 mi.^{2} colony home range area ranged considerably. The Doans Creek Colony and Plummer Creek Colony had up to 80 acres and 230 acres selectively cut along the preferred alignment for I-69 in their respective colony areas. However, no clear-cutting occurred in these two colonies, and due to the juxtaposition of the colonies along the alignment, no harvest occurred within a ½ mile radius of the colonies' centers, near the identified roosts. Both of these colonies contain over 60% tree cover (over 8,000 acres of forest) and presumably ample roosting and foraging habitat continues to be available in the area. Nearly 40% of the Doans Creek Maternity Colony falls within the boundary of the Crane Naval Surface Warfare Center. This facility routinely consults with the USFWS, Bloomington, Indiana Field Office (BFO) and manages its forests according to the

BFO's *Forest Management Guidelines for Informal Section 7 Consultations on Indiana Bats (Myotis sodalis) within the State of Indiana*. By following these guidelines, direct impacts to roosting bats are avoided, and suitable roosting habitat is maintained into the future.

In addition to federal land, approximately 400 acres of I-69 reforestation and preservation activities are located within the Doan's Creek colony area (including a parcel that falls within both the Doans Creek and Plummer Creek Colonies). Along this line, within the Plummer Creek Colony, acquisition of nearly 1,000 acres for forest preservation (primarily near the center of the colony) has already occurred and reforestation efforts are ongoing on over 300 additional acres. Based on the location and probable amount of selective harvest in these two colony areas, it is unlikely that an occupied roost tree was felled during the subject private landowner timber harvest activities in these colonies. Also, considering the mitigation and management activities occurring within these colony areas, we believe suitable roosting and foraging habitat will continue to be available and persist into the future.

Up to 230 acres was selectively harvested within the Indian Creek Maternity Colony and another 65 acres were clear-cut (near the western edge of the colony). Within a ½ mile of the colony center, up to 30 acres (9%) was selectively harvested from just over 330 acres of available tree cover. The two known roosts (alternate roosts) are not located on parcels with known harvesting. The nearest timbered parcel to a known roost tree is approximately 0.13 miles away. This parcel was selectively cut in late August, 2011. The late summer clearing date reduces the probability of non-volant pups being present. Furthermore, it is likely the colony had already begun to disperse by this time, which would greatly reduce the likelihood of bats being impacted (USFWS 2007).

We anticipate overall habitat impacts will be insignificant as a result of this activity. The Indian Creek Colony area is 60% forested and numerous snags and roosting habitat is present. The 65 acres that was clear-cut represents only about 0.9% of the entire forested habitat present in the colony area. Selective cutting in central Indiana is estimated by the local state forester to remove an average of 20 trees per acre. It is likely that the removal of larger, high quality timber trees will result in decreased snag availability in the future within the 230 acres where cutting occurred; however, the harvested acreage was spread throughout the colony area (a majority of the harvest was over ½ mile from the colony center) and over half of the acreage fell within the right of way, which was already accounted for during the initial consultation. Reforestation efforts are underway on nearly 180 acres within the colony area and almost 500 acres will be permanently protected and managed for the Indiana bat. Long term impacts to the colony as a result of the habitat modification are unlikely due to the presence of other existing suitable habitat and mitigation efforts.

The Little Clifty Branch Colony had up to 610 acres selectively harvested and 55 acres clear-cut within the 2.5 mi^2 colony area. Of this, just over 215 acres of potential selective harvest occurred within a ½ mile radius of the colony center (the clear-cut was approximately a mile from the colony center). The total tree cover in this portion of the colony is approximately 411 acre, indicating that just over half of all the forest in the colony center potentially had some selective harvest occur. All of the identified roosts occurred on properties where harvesting was known to occur. The primary roost was found down the winter following its discovery. We assume, based on the fact that timber harvest occurred that fall in the area the roost tree was located, that the snag was felled as a result of the activity occurring in its vicinity. As previously stated, there was no indication the tree had been cut down or felled by storms. It is important to note that the tree was in the proposed right of way and would have been removed during the winter of 2011-2012. The inevitable loss of this primary roost is evaluated in detail in the Section 4, Tier 2 Biological Opinion. Of the four colonies, the Little Clifty Colony is most likely to be adversely affected by the landowner clearing.

As previously suggested, a serious consequence of summer tree clearing is the potential felling of an occupied roost tree, resulting in direct mortality of individual bats. The USFWS's 2007 Indiana Bat (*Myotis sodalis*) Draft Recovery Plan reports on page 76:

> "We are aware of three documented accounts of occupied Indiana bat roost trees being felled. In all cases it was not known that the tree contained a bat roost when it was cut, and in all cases some of the bats in the tree were killed or injured. Cope et al. (1974) reported on the first known Indiana bat maternity roost tree, a dead elm in Wayne County, Indiana. The tree was located near a hedgerow that was being removed, and when the tree was destroyed during bulldozing, bats were observed exiting. The original account stated that eight bats were "captured and identified as Indiana bats," and that about 50 bats flew from the tree. Although the original account did not specify how the eight bats were captured, J. Whitaker (Indiana State University, pers. comm., 2005) recounted that those bats were killed or disabled, retrieved by the landowner, and subsequently identified by James B. Cope (a biologist). In another case, Belwood (2002) reported on the felling of a dead maple in a residential lawn in Ohio. One dead adult female and 33 nonvolant young were retrieved by the researcher. Three of the young bats were already dead when they were picked up, and two more died subsequently. The rest were apparently retrieved by adult bats that had survived. In a third case, 11 dead adult female Indiana bats were retrieved (by people) when their roost was felled in Knox County, Indiana (J. Whitaker, pers. comm., 2005)."

In order to evaluate the one-time impact the private landowner harvest may have had on the Indiana bat within the action area, we analyzed a reasonable worst case scenario which involved the felling of an occupied maternity roost in the Little Clifty Branch Colony area (this colony was the most likely to potentially be exposed to the harvest activities based on the amount and location of the activities). Using information from the Belwood (2002) and Cope (1974) papers, we estimated that if an occupied roost tree was felled, approximately 4% of the adult females would be killed and 15% of the pups. We then assessed the potential effects of this amount of take to the colony by using a demographic model (Thogmartin et al. 2013), assuming the tree-clearing activities would impact approximately 3 adults and 12 pups in a typical maternity colony of 80 adults and 80 pups (Tier 1estimate).

For our scenario, we evaluated model outputs that compared population tendencies over time with and without the estimated take from the landowner tree-clearing activities. These outputs allowed us to evaluate whether take from the action would influence the population levels differently than how the populations would otherwise trend over time. Because WNS was factored in to all the model runs, the Indiana bat population declined quickly over time for the take and no take scenarios. The goal of the analysis was to determine whether take from the proposed action changed the nature of that decline or potential recovery of the species. The demographic model assumed that WNS was present in the area beginning in 2011. However, since no population impacts have been noted to date in Indiana, the model parameters were adjusted to incorporate population impacts due to WNS beginning in 2014. Although there is no way to know for sure when or how WNS may fully impact Indiana bats in Indiana or the Midwest, the WNS impacts were based on observations of WNS-caused declines in the northeast, specifically in the state of New York, which is the best available information at this time.

The model projections (using the Indiana bat specific assumptions for WNS) predict a 79% chance of extirpation by year 50 with the private landowner clearing occurring, and a 76% chance without the landowner logging activity (Appendix B). In addition, the estimated mean time to extinction with the tree-clearing activities is 24 years with the logging compared to 23.5 years without; maximum time to extinction is the same for both scenarios. The median population growth for both scenarios is zero (0) when WNS is factored into the model. If the model is run without WNS as a factor, there are no differences in the population projections with or without the harvest impacts. Considering that WNS was only recently confirmed in the state of Indiana in the winter of 2010-2011 and that the Indiana bat population still remains stable in the state, we believe it is unlikely that the tree-clearing activities that occurred prior to the state taking ownership of the project right of way will reduce the long-term fitness of the colony. While the population models enable us to evaluate the effects of the take on the local populations, we recognize that any model prediction on the response of bat populations to WNS are speculative to some extent, and models using different assumptions on how populations respond to WNS will have different outcomes. That being said, we believe our analysis is logical and comports with existing information.

In addition to direct mortality, harvested areas typically exhibit fewer snags than unharvested areas. Low numbers of suitable snags can result in decreased quality of forested habitat for Indiana bat roosting. Tree clearing activities could have also impacted bats during fall swarming/spring staging activities, a critical fat building time period. Disturbance during this period could have reduced the fitness of bats entering hibernation or stressed bats just emerging from hibernation and preparing to give birth. Although the harvesting likely resulted in a decrease of habitat quality, based on the amount of available remaining habitat and mitigation efforts to protect and restore several hibernacula and forested habitat in the maternity colony areas (including 153 acres of preservation and 103 acres of reforestation within and adjacent to the Little Clifty Maternity Colony), we believe these impacts are short term in nature and do not affect the survivability or recovery potential of the species.

Given that the take associated with the landowner harvest activities did not likely impact the fitness or viability of Indiana bats at the local population scale (the Little Clifty Creek Maternity Colony), we do not anticipate a reduction in the likelihood of survival and recovery of the species at the Midwest Recovery Unit or rangewide scale as well.

In order to eliminate potential impacts to the Indiana bat from future private landowner tree-clearing activities associated with the development of I-69, the INDOT and FHWA have prepared a letter for property owners along Sections 5 and 6 of the preferred alignment that emphasizes the risks of killing or harming/harassing federally listed animals by timbering in Indiana bat maternity colony areas during the maternity season (Appendix C). These letters were sent out on July 9, 2013 for Section 5, prior to the start of the appraisal process in this section. In these letters, FHWA, through INDOT, encourages private landowners and loggers to act in accordance with the cutting restriction timeframe of November 16-March 31 as described in the Revised Tier 1 Biological Opinion. The letters also ask that private landowners contact the I-69 Section 5 Project office if they are considering a tree-harvesting activity between April 1 and November 15. Please note the tree clearing restrictions in Section 5 are in place from April 1-November 15 in the WAA (from the I-69 Section 4 interchange north to Arlington Road) and April 1-September 30 in the SAA (Arlington Road north to the northern project terminus).

Furthermore, INDOT and FHWA have agreed to a new conservation measure that includes paying a willing landowner for an early “right of entry” or other type of agreement or covenant on their parcel; FHWA, through INDOT, will contact landowners of property within areas of concern within the right-of-way to discuss options for deferring tree clearing activities to the approved tree-clearing timeframe of November 15-March 31 within the WAA and October 1-March 31 in the SAA. This will voluntarily limit the timing of private timber harvest to a period outside of the maternity season. These offers will be made on a case by case basis in coordination with the USFWS’s Bloomington, Indiana Field Office (for a list of Conservation Measures see Appendix D).

Conclusion

(Our non-jeopardy conclusion regarding impacts to the bald eagle still stands as stated in the original December 3, 2003 Tier 1 BO.)

After reviewing the current status of the Indiana bat, updated information regarding the environmental baseline for the action area, and new information regarding the two new colonies, additional forest and wetland impacts, and impacts from private landowner tree-clearing activities along the preferred alignment in Section 4, the USFWS has concluded that appreciable reductions in the likelihood of survival and recovery of Indiana bats due to the construction, operation, and maintenance of I-69 from Evansville to Indianapolis, Indiana are unlikely to occur, and hence, the FHWA has ensured that their proposed action is not likely to jeopardize the continued existence of the Indiana bat or destroy or adversely modify designated critical habitat.

Our basis for this conclusion follows:

- Neither the additional forest impacts due to utility/billboard relocations (including those in the various individual hibernacula WAAs) nor the additional acres of wetland impacts are likely to adversely affect any of the known maternity colonies, hibernacula, male Indiana bats, or the local hibernating/swarming populations. The impacts will result in minimal, short-term loss of habitat with no direct take anticipated due to tree-clearing restrictions.

- Private landowner timber harvests that took place primarily in 2011, within and adjacent to the I-69 project right-of-way, were primarily a concern for the Little Clifty Maternity Colony. Based on model predictions, we do not believe that this activity has resulted in a long-term reduction of fitness (reproductive potential or survival) for this maternity colony.

- Although the selective harvesting activities may have reduced the number of snags present in an area, based on the existing amount of forested habitat in Section 4 and the average number of snags present, numerous snags will still be available in the area. Furthermore, in most instances, the harvested areas were strung throughout the colony area, and not concentrated in the colony's core.

- FHWA and INDOT have developed additional landowner correspondence and an additional conservation measure to specifically address the issue of private landowner tree clearing in the Action Area.

- In general, areas with less than 5% forest cover are not capable of sustaining an Indiana bat maternity colony. Currently, forest coverage (*i.e*. tree cover) in the maternity colonies ranges from 10.5% to 70% (estimates for tree cover loss at the colony with 10.5% tree cover is only 1 acre total); see Table B2 for tree cover estimates per colony. The construction of I-69 (and associated utility/billboard relocations) will directly reduce the total amount of forest habitat/tree cover available around each of the 16 known colonies and in some cases will cause small additional amounts to be indirectly lost by induced development. When combined, the percentages of existing tree cover that will be directly and/or indirectly impacted at each maternity colony is very small. Twelve of the 16 colonies will lose less than 1% of their tree cover, and the other four will lose 1.4%, 1.7%, 2.1%, and 2.6%; therefore, the total amount of forest loss is, we believe, insignificant for each colony. We do not anticipate any long-term reductions in maternity colony reproductive success or survival as a result of this loss.

- We do not believe that any of the 16 maternity colonies will be permanently displaced by the interstate; that is, sufficient quality and quantity of habitat will remain throughout the life of the project. In addition, the proposed 3:1 mitigation commitment for upland forest losses will largely be focused on improving forest habitats within these affected maternity colony areas, and thus, any adverse impacts from habitat loss will be temporary.

- We estimate the incidental take of Indiana bats **during the summer,** as a result of the proposed action, will be no more than 307 bats (261 females/juveniles and 46 males) spread over a 17-year long period. On an annual basis, this equates to about 18 bats being taken (largely as a result of harm or harassment, not mortality) per year, during the summer, throughout the entire project corridor. Table B4 in Appendix A breaks down the anticipated take by colony and males. This total take equates to less than 1% of the Indiana bat population that occupies these areas each summer.

- We estimate the proposed action will only directly or indirectly take a relatively small number of bats **during fall, winter and spring** (estimated total = 761 bats over a 17-year long period or about 44 bats/year; see Table B5) and will only have minimal, short-term effects on these bats' respective maternity colonies and hibernating populations. The estimated amount of yearly take represents only 0.05% of the *annual* winter population within the Action Area. Loss of these individuals will have no measurable effects on the viability of other maternity colonies in the region or the species' range or to hibernating populations to which these individuals belong. Again, the proposed action in combination with relatively small amounts of cumulative impacts/take is not reasonably expected, directly or indirectly, to cause an appreciable reduction in the reproduction, numbers or distribution of the Indiana bat at local, regional, range-wide scales.

- Mitigation and conservation efforts associated with the project will include over 2,200 acres of reforestation (with permanent protection) and the permanent conservation of an additional 4,000-plus forested acres, managed for the Indiana bat and other wildlife species. Reforestation and restoration efforts will more than offset the anticipated direct forest and wetland loss (including the acreage clear-cut by private landowners) and the additional acreage of forest preservation will ensure suitable bat habitat remains in the area in perpetuity.

- Permanent conservation easements have been placed on the fourth and sixth largest hibernacula in the state (and   Caves); protection of these Priority 1A hibernacula is very important for the long term protection and recovery of the species. Specifically, permanent protection at   Cave will eliminate the estimated take due to vandalism and human disturbance. Furthermore, permanent protection of both caves and their surrounding forests provides long-lasting protection of essential fall swarming habitat for the 38,000 Indiana bats that use these caves and eliminates future possibilities for this property to be developed.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are **non-discretionary**, and must be undertaken by the FHWA or their designee (e.g., INDOT) for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Since the Tier 1 Consultation, Tier 1 Revised PBO dated August 24, 2006, and the May 25th, 2011 Amendment to the Tier 1 RPBO, there have been additional refinements to the alignment for Sections 1, 2, 3, 4, and 5 and more accurate habitat impact calculations, as well as updated Indiana bat population estimates. Those numbers have been updated in this amended Incidental Take Statement (ITS);

INDIANA BAT

AMOUNT OR EXTENT OF TAKE

The Service believes it is reasonably certain to anticipate that incidental take of Indiana bats will occur as a direct or indirect result of the Proposed Action in the following forms:

- death/kill and/or injury/wound from direct felling of occupied trees (during indirect/induced development),
- death/kill and/or injury/wound from direct collision with vehicles traveling on I-69 once it is operational (*i.e.*, roadkill),

- death/kill/wound/harassment of hibernating Indiana bats in unprotected Indiana bat hibernacula as an indirect result of project-induced population growth and increased vehicular accessibility to hibernacula areas,
- harassment of roosting bats from noises/vibrations/disturbance levels causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time, and
- harm through loss of roosting habitat such as primary and/or alternate roost trees, and loss of foraging habitat.

Based on our knowledge of the ecology of Indiana bats, and the distribution of Indiana bats within the Action Area of I-69, we assume that the habitat that will be lost will adversely affect the roosting and foraging habitat of Indiana bats.

Based on our analysis of the environmental baseline and effects of the proposed action, the Service anticipates that 16 Indiana bat maternity colonies occupy the Action Area and therefore may be impacted as a result of the proposed activities. The effect of the loss of foraging habitat is expected to result in the harm of some bats (*e.g.*, as the result of exposure to predation or overwinter mortality of bats that failed to store adequate fat reserves). Loss of roosting habitat and degradation of remaining habitat may also result in harm of individual bats. While some adverse effects are not expected to directly result in the death of bats, they may exacerbate the effects of other ongoing stressors on the bats. Collectively, the effects of the action are expected to result in behavioral or physiological effects which impair reproduction and recruitment, or other essential behavioral patterns. We anticipate take/death of individuals, decreased fitness of individuals, reduced reproductive potential, and reduced overwinter survival of a maximum of 307 Indiana bats within the Action Area during the summer and 761 Indiana bats during the fall, winter, and spring as detailed in Tables B4 and B5 in Appendix A, respectively. The effects on the 16 known maternity colonies may be lost reproductive capacity and potentially a short-term decline in their colony sizes. No significant, long-term adverse effects to affected maternity colonies are anticipated.

Construction of I-69 along the proposed 3C alignment and its associated actions is expected to result in the permanent loss of just over 2,000 acres of suitable summer foraging and roosting habitat (forest and wetlands) for Indiana bats, a decrease of approximately 165 acres from the 2006 Tier 1 RPBO estimate. Degradation of remaining habitat is also likely to occur from increased fragmentation and increased disturbance.

It is unlikely that direct mortality of small-sized bats from roadkill will be detected, that is, we do not expect that most dead or moribund bats are likely to be found. The same is true for take associated with habitat modification/loss and disturbance; detecting or finding dead individuals is unlikely. Therefore, the anticipated levels of take primarily are being expressed below as the permanent, direct loss of currently suitable summer roosting and foraging habitat and fall swarming and staging habitat in the Action Area for Indiana bats that will result from project implementation as estimated in the Tier 1 BA Addendum and subsequent Tier 2 BAs for Sections 1, 2, 3 and 4. Human vandalism and disturbance at the various hibernacula will be tracked via routine surveys and existing data loggers at most sites. Finally, the FHWA will record and track any known Indiana bat roadkills to ensure that the anticipated amount of incidental take is not exceeded.

Summer Action Area:

Permanent direct loss of up to 1,973 acres of forest habitat and 30 acres of non-forested wetlands is anticipated. Approximate direct loss and exempted levels of take of Tier 2 forest within each project section is summarized in Table 1 below. New estimates were based on refinements detailed in Tier 2 Biological Assessments for Sections 1, 2, 3, 4 and 5; data from Table 3 of the Tier 1 BA Addendum was used for Section 6. The exempted level of take for forest habitat in Section 5 was increased from 303 acres in the Tier 1 RPBO ITS to 350 acres; expected loss of non-forested wetlands has been increased from 20 acres to 30 acres.

Table 1. Tier 1BA Addendum Estimated Direct Loss of Forest within the I-69 Summer Action Area and Revised Estimates for Forest Loss based on Tier 2 numbers.

Project Section	Tier 1 BA Addendum Estimated Direct Loss of Tier 2 Forest (acres)	Revised Tier 2 Estimated Direct Forest Loss (acres) including utility-related forest impacts*
1	55	28
2	280	212
3	112	67
4	1,132	1,050
5	303	350**
6	266	266***
Total	**2,148**	**1,973**
*Sections 1-4 have been updated with the most current design information. The impacts in Sections 1-3 show the acreage of upland forest that was removed within the construction limits plus wetland forest and utility impacted forest. The impacts in Section 4 show the acreage of upland forest within the right-of-way plus wetland forest and utility impacted forest. Please note for the utilities in Section 4, an additional 2.5 acres was added in to provide a buffer since the data has not been field verified. The impacts in Section 5 include upland forest within right-of-way, the forested wetlands impacted, as well as the estimated utility and billboard impacts at that time. Section 6 reflects the same number that was estimated in the Tier 1 BA Addendum.		
** This is the revised requested amount of habitat impact; actual impact amount is currently estimated at 345		
***From Tier 2 Representative Alignment as described in the Tier 1 BA Addendum.		

Winter Action Area (overlaps with Summer Action Area):

Permanent direct loss of **up to** 1,248 acres of forest habitat surrounding the 15 known hibernacula (and expanded in areas where induced growth is likely) is anticipated (from the Tier 2 Section 5 BA and includes utility and billboard impacts). Approximate direct loss of Tier 2 forest within a 5-mile radius of each hibernaculum is summarized in Table 2 below. The sum of the individual acreages is greater than 1,248 acres because of a high degree of overlap among the impacted acres surrounding the hibernacula. Increases in exempted levels of take have been made for Cave, Cave, Cave, Cave, Cave, and Cave.

Hibernaculum Name	Current Estimated Direct Loss of Tier 2 Forest (acres)	2006 Tier 1 RPBO and Newly Revised (shaded) Levels of Take*
Cave:	556.98	694.10
Cave:	498.49	611.60
Cave:	431.72	574.20
Cave:	404.56	509.30
Cave :	452.52	474.10
Cave:	320.65	359.70
Cave:	346.13	385.00
Cave:	293.87	305
Cave System:	262.01	275
Cave:	99.26	110
Cave:	111.5	125
Cave:	84.26	95
Cave:	57.03	70
Cave:	0	0
Cave:	12.76	12.98**

*Shading indicates the six hibernacula where estimated levels of take of forest habitat were amended per this 2013 Tier 1 Reinitiation Consultation. These amended impact amounts would have an additional 10% exceedance allowance added to them for reinitaion requirement per the ITS. The remaining 2006 Tier 1 levels (non-shaded) include the 10% exceedance allowance.

**Established during the 2011 Tier 1 Reinitiation

Table 2. Updated Estimated Direct Loss of Tier 2 Forest within a 5-mile radius of each Hibernaculum within the I-69 Winter Action Area Compared with Re-initiation threshold levels.

Roadkill:

The Service anticipates that all bats that are struck by vehicles likely will be killed. <u>The Service assumes that the annual number of deaths by vehicle collisions is not likely to exceed 21 Indiana bats per calendar year through the year 2030</u>. The anticipated 5% mortality rate is not expected to commence until the highway is completely constructed and fully operational; some smaller percentage of bats may be impacted as significant portions are completed. It is likely that the anticipated amount of roadkill will be somewhat off-set when local traffic begins to divert to the interstate, therefore lowering roadkill along existing highways and local roads. Furthermore, it is likely that the impacts associated with Sections 5 and 6 will be significantly lower than the estimated 5% because the project involves an upgrade of an existing four-lane state highway as opposed to new construction, such as has occurred in Sections 1-4. Based on the best available scientific data, the actual number of Indiana bats that may be struck and killed from vehicles traveling on I-69 between Evansville and Indianapolis cannot be precisely quantified and dead bats will be difficult to locate once I-69 is operational. If more specific information becomes available, then this issue will be reexamined during the Tier 2 consultations and prudent adjustments will be made at that time.

EFFECT OF THE TAKE

In the accompanying amendment to the Tier 1 RPBO, the Service determined that the aggregate level of anticipated take is not likely to result in jeopardy to Indiana bats or destruction or adverse modification of designated Critical Habitat (*i.e.*,   Cave).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of Indiana bats:

1. In the Tier 1 BA Addendum (also listed in the Tier 1 RPBO, pg. 16), the FHWA proposed to investigate and/or implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of wildlife species, including Indiana bats. The Service will take the necessary steps to ensure that the FHWA successfully implements all the conservation measures to the fullest extent practicable.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

3. All I-69 construction personnel and INDOT maintenance staff need to be made aware of potential issues concerning Indiana bats and construction and maintenance of I-69.

4. The FHWA needs to ensure that the impacts of take associated with future Tier 2 section-specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented and anticipated levels of incidental take will not be exceeded nor will any new forms of take occur that were not anticipated in Tier 1RPBO or the recent amendments (2011 and 2013) to the Tier 1 RPBO.

The Service believes that the measures above are necessary, appropriate, and reasonable for minimizing take of Indiana bats.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA (and/or INDOT and their contractors or assigns) must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. The FHWA must implement all proposed mitigation and conservation measures, as detailed in the revised "Tier 1 Forest and Wetland Mitigation and Enhancement Plan" and "Conservation Measures for Impacts to Threatened and Endangered Species" sections of the Tier 1 BA Addendum and Appendix B of the Tier 1 BA or alternative measures that are of equal or greater benefit to Indiana bats as developed in consultation with the Service during Tier 2 consultations.

2. FHWA will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service's BFO by 31 January each year and reporting will continue for at least 5 years post-construction or until otherwise agreed to with the Service.

   If proposed conservation measures or mitigation goals cannot be realized (e.g., lack of willing-sellers), then FHWA will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to Indiana bats within the Summer and Winter Action Areas.

3. All I-69 engineering supervisors, equipment operators, and other construction personnel and INDOT (and/or concessionaire) maintenance staff will attend a mandatory environmental awareness training that discloses where known sensitive Indiana bat sites are located in the project area, addresses any other concerns regarding Indiana bats, and presents a protocol for reporting the presence of any live, injured, or dead bats observed or found within or near the construction limits or right-of-way during construction, operation, and maintenance of I-69.

4. To ensure that the impacts of take associated with future Tier 2 project-section specific action are appropriately minimized and that the exemption of incidental take is appropriately documented, the U.S. Fish and Wildlife Service has or will prepare an individual Tier 2 BO for each of the six Tier 2 Sections for which we conclude will be

likely to adversely affect the Indiana bat (*Myotis sodalis*) and/or bald eagle (*Haliaeetus leucocephalus*). The Tier 2 BO for a Section will be a stand-alone document that "tiers" back to the Tier 1 Revised Programmatic BO (as amended), rather than being physically appended to it as previously described.

While conducting each of the Section-specific "second tier" consultations, the Service has or will ensure that each action proposed under I-69's programmatic-level design standards (1) are consistent with the previously evaluated standards and conservation commitments (2) will have the effects anticipated during the landscape/programmatic-level analysis, that is, that there is nothing unusual about the proposed Section-specific project that will result in unanticipated impacts, and (3) that the environmental baseline will be appropriately updated.

As previously proposed, the Service has or will review the information provided by FHWA and INDOT within each of the Tier 2 Biological Assessments (BAs) for each I-69 Section. We will (1) confirm the species that may be affected, (2) assess how the action may affect the species, including ensuring that the level of effect is commensurate with the effects contemplated in the Tier 1 programmatic-level BO (as amended), and (3) verify the current tally of the cumulative total of incidental take that has occurred to date is below the levels anticipated in the 2006 programmatic incidental take statement (ITS) as amended (2011 and 2013). During this review, if it is determined that an individual Section of I-69 is not likely to adversely affect listed species, the Service has or will complete its documentation with a standard concurrence letter stating that the Service concurs that the proposed project Section is not likely to adversely affect listed species or designated critical habitat. The concurrence letter will refer to the Tier 1 Revised Programmatic BO (*i.e.*, it "tiers" to it), and specify that the Tier 2 BA is consistent with the analysis underlying the Tier 1 Revised Programmatic BO (as amended). However, if information presented in a Tier 2 BA establishes that the proposed Section-specific actions are likely to adversely affect listed species or designated critical habitat, then the Service will complete a Tier 2 BO along with a Section-specific ITS. No incidental take shall be exempted until after a Tier 2 BA has been reviewed and has been found to be consistent with Tier 1 in a Section-specific concurrence letter, or until a Section-specific Tier 2 BO and ITS have been completed by the Service.

Because acreages of lost Indiana bat habitat are being used as a surrogate to monitor levels of incidental take within the entire Action Area as well as within each Tier 2 Project Section and 5-mile radius around each known hibernaculum, the FHWA will provide the Service's Bloomington Field Office with a detailed description of each project section's contribution to habitat loss by preparing a Tier 2 Biological Assessment for each project section. The Tier 2 Biological Assessments must include: maps of the preferred final alignment and all associated development; methods and results of Tier 2 mist net surveys, radio-tracking studies, roost tree emergence counts, and hibernacula surveys; exact locations of all known and newly discovered Indiana bat roost trees and hibernacula (hibernacula location maps must identify known hydrologically connected surface streams and sinkholes and their drainage basins and delineate approximate boundaries of potential recharge areas for each hibernaculum within the Action Area in relation to I-69's direct and indirect impacts as identified during Tier 2 and previous studies); the total acreages and relative quality of forest (e.g., maturity of forest/estimated dbh of live canopy trees and estimated suitability for roosting/estimated number and dbh of snags) and wetland habitats that will be directly impacted and permanently cleared/filled; and all other anticipated project section-specific impacts. Tier 2 BAs must also describe any additional direct or indirect effects that were not considered during the Tier 1 programmatic-level consultation. To reduce redundancy, Tier 2 BAs should summarize or simply reference sections of the Tier 1 BA and BA Addendum that would otherwise be repetitive.

Each Tier 2 BA must quantify how the individual Tier 2 project section's direct impact acres contribute to the estimated project section-specific and hibernacula-specific acres (see Tables 1 and 2 above) as well as to the project-wide forest acres (currently estimated to be 1,973 ac.) and non-forested wetland acres (30 ac.) as specified in the AMOUNT OR EXTENT OF TAKE section above. The Tier 2 BAs should also report how much total acreage remains for the overall I-69 project and within each project section in the SAA and hibernacula in the WAA (*i.e.*, provide the running totals and the remaining balances for these exempted levels of take).

FHWA's cover letters requesting project-section specific ESA Section 7 reviews must include a determination of whether or not the proposed project is consistent with the Tier 1 Programmatic Biological Opinion and Incidental Take Statement (as amended) and request a Section-specific concurrence letter or initiation of Formal Consultation resulting in a Section-specific Tier 2 BO and ITS. The cover letter, and one bound hard copy and an electronic copy of the Tier 2 BA should be submitted to the BFO when requesting a project section review.

5. Any dead bats located within the construction limits, right-of-way, rest stops, or mitigation areas of I-69, regardless of species, should be immediately reported to BFO [(812) 334-4261], and subsequently transported (frozen or on ice) to BFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to BFO. BFO will make a species determination on any dead or moribund bats. If an Indiana bat is identified, BFO will contact the appropriate Service Law Enforcement office as required.

   The FHWA will keep track of all known Indiana bats killed from vehicle collisions to ensure that the anticipated amount of incidental take, <u>21 killed per calendar year,</u> is not exceeded.

<u>ATTENTION</u>: If at any point in time during this project, the exempted project-wide or section-specific, or hibernacula-specific habitat acreages or annual number of roadkilled bats quantified in the AMOUNT OR EXTENT OF TAKE section of this ITS are exceeded by more than 10%, then the Service will assume that the exempted level of take for this project may have been exceeded and the FHWA should immediately reinitiate formal consultation.

In conclusion, the Service believes that the permanent loss of currently suitable summer roosting and foraging habitat for Indiana bats will be limited to a maximum of 1,973 acres of forest habitat and 30 acres of non-forested wetlands within the Summer Action Area (the portion of the Action Area used by the Indiana bat in the summer) and including 1,248 acres of forest habitat (including utility and billboard impacts) that also falls within the Winter Action Area (portion of the Action Area used by the Indiana bat during the fall, winter, and spring). These acreages represent approximately a 1% loss of the SAA's forested acreage and a 1% loss of the WAA's forested acreage and will occur over a period of at least several years. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded (or tree clearing occurs during the period April 1-September 30 in the SAA or April 1-November 15 within the WAA any given year) such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action/program on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations generally do not focus on a specific project, but rather on an agency's overall program.

The Service provides the following conservation recommendations for the FHWA's consideration; these activities may be conducted at the discretion of FHWA as time and funding allow:

<u>INDIANA BAT</u>

1. Working with the Service, develop national guidelines or best management practices for addressing Indiana bat issues associated with FHWA projects within the range of the Indiana bat, including measures to avoid and minimize private landowner impacts to the species prior to state and/or federal acquisition.

2. Provide funding to expand on scientific research and educational outreach efforts on Indiana bats in coordination with the Service's BFO.

3. In coordination with the BFO, purchase or otherwise protect additional Indiana bat hibernacula and forested swarming habitat in Indiana.

4. Provide funding to staff a full-time Indiana bat Conservation Coordinator position within the BFO, which has the Service's national lead for this wide-ranging species.

5. Provide funding for research to address White Nose Syndrome in bats.

BALD EAGLE

1. Working with the Service, develop guidelines for addressing Bald Eagle issues associated with FHWA projects in the Midwest.

2. Provide funding to implement a bald eagle post-delisting monitoring plan in Indiana or throughout the Midwest.

3. Expand on educational and outreach efforts on bald eagles in Indiana.

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

REINITIATION NOTICE

This concludes the reinitiation of formal programmatic consultation with FHWA on the construction, operation, and maintenance of the I-69 from Evansville to Indianapolis, Indiana and associated development. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action (e.g., highway construction and associated development) are subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Literature Cited

Belwood, J.J. 2002. Endangered bats in suburbia: observations and concerns for the future. Pp. 193-198 *in* A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

Bennett, V.J. and A. Zurcher. 2012. When Corridors Collide: Road-Related Disturbance in Commuting Bats. The Journal of Wildlife Management 77(1):93‑101.

Bennett, V.J., D.W. Sparks, P. A. Zollner. 2013. Modeling the indirect effects of road networks on the foraging activities of bats. Landscape Ecology 28:979–991.

Cope, J.B., A.R. Richter, and R.S. Mills. 1974. A summer concentration of the Indiana bat, *Myotis sodalis*, in Wayne County, Indiana. Proceedings of the Indiana Academy of Sciences 83:482-484.

Garber, S.M., J.P. Brown, D.S. Wilson, D.A. Maguire, and L.S. Heath. Snag longevity under alternative silvicultural regimes in mixed-species forest of central Maine. Canadian Journal of Forest Research 35:787-796.

Humphrey, S.R., A.R. Richter, and J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. Journal of Mammalogy 58:334-346.

Ohmann, Janet. 2002. Snag dynamics in western Oregon and Washington, DecAID - Decayed Wood Advisor Digital Report. Accessed 17 June 2013 at www.digitalcommons.usu.edu

Thogmartin, W.E., C.A. Sanders-Reed, J.A. Szymanski, P.C. McKann, L. Pruitt, R.A. King, M.C. Runge, and R.E. Russell. 2013. White-nose syndrome is likely to extirpate the endangered Indiana bat over large parts of its range. Biological Conservation 160:162-172.

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.

U.S. Fish and Wildlife Service. 2009. Indiana Bat (*Myotis sodalis*) 5-year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Midwest Region, Bloomington, Indiana. 44 pp.

Whitaker, J.O., Jr. and V. Brack, Jr. 2002. Distribution and summer ecology in Indiana. Pp. 48-54 *in* A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

Wibbelt, G., A. Kurth, D. Hellmann, M. Weishaar, A. Barlow, M. Veith, J. Prüger, T. Görföl, L. Grosche, F. Bontadina, U. Zöphel, H. Seidl, P.M. Cryan, and D.S. Blehert. 2010. White-nose syndrome fungus (*Geomyces destructans*) in bats, Europe. Emerging Infectious Diseases. [serial on the Internet]. Vol. 16, No. 8 - Aug 2010 [accessed 03-16-2011]. http://www.cdc.gov/EID/content/16/8/1237.htm

Wisdom, M. and L.J. Bate. 2008. Snag density varies with intensity of timber harvest and human access. Forest Ecology and Management 255:2085-2093.

Zurcher, A. A., D. W. Sparks, and V. J. Bennett. 2010. Why the bat did not cross the road. Acta Chiropterologica, 12(2): 337–340.

Appendix A

Table B1. Project deconstruction, anticipated direct and indirect environmental consequences, and likely responses of exposed bats (2013).

Project Element	Associated Direct and Indirect Environmental Consequences	Likely Responses of Exposed Bats/Colonies/Pops.	Is Take Reasonably Certain to Occur?
CONSTRUCTION			
Site Preparation: clearing, blasting, cutting, filling,	Permanent direct loss of suitable roosting and foraging habitat in SAA (summer habitat)	0,4,5,6,7,9,10,11,12	yes
grading, and surfacing for interstate, interchanges,	Permanent direct loss of suitable roosting and foraging habitat in WAA (swarming habitat)	0,4,5,6,7,8,12	yes
connector roads, frontage roads, and rest areas.	Variable loss/reduction of forested connectivity/travel corridors	0,4,5,6,7,9	yes
	Introduction of novel day/night-time construction noise,light, and dust (e.g., heavy equip. and blasting)	0,1,3,4,5,6,7,9,10,11,12	yes
	Direct degradation of surface water quality (e.g., increased siltation/turbidity) in streams	0,6,7	no
	Direct loss and/or degradation of 20 acres of existing non-forested wetlands	0,5,6,7,	no
	Direct impacts or degradation of non-hibernacula, karst features and ground water resources	0,6	no
	Potential forest loss from borrow areas, rock quarries, and sand/gravel pits used for road materials	0-7,9,10,11,12	yes
Demolition of existing bridges in SAA	Potential loss of roost sites beneath bridges	0,1,3,4,6	no
Construction of bat-friendly bridges in SAA	Potential net gain in day/night roost sites for bats	0,6,8,13,14	no
Revegetation of disturbed areas	Long-term protection against erosion, some insect production	0,6	no
Relocation of homes & businesses/Demo. of old	Addtnl. habitat loss/degradation and disturbances of bats during construction of new and demo. of old	0-7,9,10,11,12	yes
Landowner tree clearing prior to selling to INDOT	Addtnl. Roosting & foraging habitat loss/degradation and disturbances of bats; direct take	0-7,9,10,11,12	yes
Relocation of utilities crossing over/under I-69	Additional habitat loss/degradation and disturbances of bats (e.g., powerlines)	0-7,9,10,11,13	yes
OPERATION			
Vehicles driving on Interstate	Increased high-speed traffic through bat population centers leading to increased risk of roadkill	0,2,11,12	yes
(toll or non-toll)	Increased litter and noise/air/soil/light pollution from vehicles using I-69	0,6	no
	New and/or increased risk of accidental spills of hazardous materials occuring in action area	0,2,7,9,15	no
Stormwater diversion and retention	Degraded water quality from road runoff	0,15	no
Induced development	Degraded water quality from induced development (e.g., faulty septic systems, more NPDS dischargers)	0,5,6,7,9,	no
	Habitat loss/fragmentation/degradation near hibernacula/mat.colonies from induced development	0-7,9,10,11,12	yes
	Induced human population growth increases risk of human visitation and vandalism at hibernacula	0,1,2,3,4,6,7,12,15	yes
High-mast lighting at interchanges and urban areas	Increased light pollution	0,5,6	no
I-69 Community Planning Grant Progam	I-69 induced growth is managed under local land-use plans designed to be protective of environment	0-15	no
MAINTENANCE			
Annual winter applications of salt	Degradation of surface and ground water and potential reduction in aquatic insect abundance/diversity	0,5,6,7,9,	no
Annual summer mowing and herbicide use	Periodic noise, reduced vegetation and minimal reduction in insect abundance	0,1	no
Periodic resurfacing	Increased noise, night-time lighting, and dust	0,6	no
CONSERVATION MEASURES			
Purchase/protect existing forest in SAA	Permant protection of some important forest lands benefiting local maternity colonies	0,8,13,14	no
Plant and permanently protect new forest in SAA	Insures no net loss of forest habitat from direct impacts of I-69 (no mitigation of indirect impacts)	0,8,13,14	no
Purchase/protect swarming habitat in WAA	Permant protection of some important forest lands benefiting local swarming/hibernating populations	0,8,14	no
Plant and permanently protect new forest in WAA	Insures no net loss of forest habitat from direct impacts of I-69 (no mitigation of indirect impacts)	0,8,14	no
Purchase/protection of hibernacula in WAA	Permant protection of important caves used by local hibernating populations	0,8,14	no
Install gates and signs at hibernacula in WAA	Reduces risk of unauthorized visitation/disturbance/vandalism of hibernacula and hibernating bats	0,8,14	no
Conduct additional bat research and monitoring	Knowledge gained will improve current management of hibernacula and maternity habitats	0,8,13,14	no
Protective fencing put beneath bridge/roost site	Reduced incidence of vandalism and human disturbance	0,8,13,14	no
Wetland mitigation and Wetland MOU	Insures no net loss of wetlands from direct impacts from I-69 (no mitigation of indirect impacts)	0,8,13,14	no
Karst studies and implementation of Karst MOU	Insures protection of sensitive karst resources	0,8,13,14	no
Creation of educational materials and displays	Increased protection of Indiana bats stemming from impoved public awareness/education	0,8,13,14	no
GIS data made available to public and agencies	Greater awareness/protection of sensitive resources identified during I-69 planning	0,8,13,14	no

Key

0. no response
1. startled: increased respiration/heart rate
2. death/injury of adults and/or offspring
3. flees from roost during daylight / ↑predation risk
4. abandons roost site(s)
5. abandons foraging areas
6. shifts focal roosting and/or foraging areas
7. ↑ energy expenditures / ↓ fitness (short-term)
8. ↓ energy expenditures / ↑ fitness (long-term)
9. aborted pregnancy/repro. failure
10. ↑torpor, delayed development/partuition, and/or delayed sexual maturation of offspring
11. short-term ↓ colony reproductive rate (3-4 seasons)
12. short-term ↓ in colony/hibernaculum size (3-4 seasons)
13. long-term ↑ colony reproductive rate
14. long-term ↑ in colony/hibernaculum size/fitness level
15. long-term ↓ in colony/hibernaculum size/fitness level

n/a not applicable

Table B2. Updated Impacts to Tree Cover in the Summer and Winter Action Areas - 2013 (bold font indicates higher levels of concern; grey shading indicates updated information).

Area Name	Existing Amount of Tree Cover (acres)	Current % of Tree Cover[1]	Updated (Sec. 1-5) Direct Loss of Tree Cover (acres)	Net change since Tier 1	Indirect Loss of Tree Cover (acres)	Sum of I-69 related Losses to Tree Cover (acres)	% of Tree Cover after I-69	Net Loss in Existing Tree Cover caused by I-69	Estimated Cumulative Loss of Tree Cover (acres)	Total Loss of Tree Cover from I-69 and Cumulative Impacts by 2030 (acres)	Total % Tree Cover Left after I-69 and Cumulative Impacts by 2030[2]	Net Decrease in % Tree Cover by 2030
Source:	Tier 1 BA Addendum Table 7 and Tier 2 BAs if applicable					calculated	calculated	calculated	BAA T-7/Tier 2 BA	calculated	calculated	calculated
Pigeon Creek	1,944	**15.5%**	10	-19	1	11	15.4%	0.1%	279	290	**13.2%**	**2.3%**
Patoka River	3,982	31.7%	20	1	0	20	31.5%	0.2%	24	44	31.3%	0.4%
Flat Creek[7]	5,426	43.2%	76	-16	0	76	42.6%	0.6%	6	82	42.5%	0.7%
East Fork	3,116	**24.8%**	42	-8	0	42	24.5%	0.3%	5	47	24.4%	0.4%
Veale Creek	2,437	**19.4%**	20	0	2	22	19.2%	0.2%	6	28	**19.2%**	0.2%
West Fork (Elnora)	1,319	**10.5%**	0	-3	1	1	10.5%	0.0%	25	26	**10.3%**	0.2%
Doans Creek	8,099	64.5%	84	-11	3	87	63.8%	0.7%	3	90	63.7%	0.7%
Plummer Creek	8,550	68.0%	**207**	**14**	1	208	66.4%	**1.7%**	5	213	66.3%	1.7%
Little Clifty Branch[8] (2010)	8,825	70.2%	252		8	260	68.2%	2.1%	16	276	68.0%	2.2%
Indian Creek	7,549	60.1%	**315**	**-44**	9	324	57.5%	**2.6%**	26	350	57.3%	2.8%
Beanblossom Creek NP[8] (2012)	8,371	66.6%	**0**		0	0	66.6%	**0.0%**	62	62	66.1%	0.5%
W. Fork (Bryant Creek)[9]	4,710	37.5%	66.4	40.6	0.9	67	36.9%	0.5%	6	73	36.9%	0.6%
Lambs Creek[8] (2012)	5,058	40.3%	7.1		0.1	7	40.2%	0.1%	36	43	39.9%	0.3%
W. Fork (Clear Creek)	5,375	42.8%	99		0	99	42.0%	0.8%	26	125	41.8%	1.0%
W. Fork (Crooked Creek)	3,722	**29.6%**	**170**		0	170	28.3%	**1.4%**	44	214	**27.9%**	**1.7%**
W. Fork (Pleasant Run)	2,276	**18.1%**	29		4	33	17.8%	0.3%	83	116	**17.2%**	0.9%
Totals[6]:	80,759		1,368	-45	30	1,398			652	2,050		
Averages:	5,047.4	40.2%	87.3		1.9	89.2	39.5%	0.7%	40.8	130.0	39.1%	1.0%
Expanded Remaining Summer Action Area[4] (excluding WAA overlap)	62,307	17.6%	862		58	920	17.6%	0.0%	798	1,718	17.4%	0.2%
Expanded Winter Action Area[5]	148,182	60.4%	1,267		70	1,337	60.5%	-0.1%	1,563	2,900	59.9%	0.5%

1. 12,566 acres in a 2.5-mile radius maternity circle.
2. proposed forest mitigation acreages or other potential gains in forest have not been included here.
3. This relative ranking is largely based on current and predicted levels of forest habitat, connectivity of existing habitat, and proximity to rapidly developing areas.
4. A total of 353,574 acres comprise the Expanded Remaining SAA (minus the WAA overlap and maternity colony areas);

Numbers in this row are derived from Tier 1 and Tier 2 Forest Data (i.e., not "Tree Cover"). Sections 1,5,and 6 do not have "Expanded" remaining SAA forest acreage calculated, so Tier 1 info was used.

5. A total of 245,484 acres comprise the collective Expanded Winter Action Area; acreages for the Expanded WAA are in Tree Cover. Tree cover impacts include new utility info for Sec. 4 & 5 and billboard impacts. Updated 5/2013.
6. Overlap areas for four maternity colonies have been subtracted from the direct forest impact totals; there may be very minimal double-counting in the cumulative impacts total due to these overlap areas.
7. The interchange in the Flat Creek maternity area is no longer proposed, so indirect impacts have been reduced in Tier 2.
8. New maternity colonies; habitat impacts in the area of these colonies were already accounted for in Tier 1, but are now addressed at the maternity colony level instead of part of the Remaining Summer Action Area.
9. Updates to the Bryant Creek colony impacts include 11.5 acres of utility impacts

Table B3. Summary of impacts to Indiana bat maternity colonies (n=16) along I-69. (Updated April 2013)

Colony Name	Percent of the MA* that is currently tree covered/ forested	Percent of existing tree cover that is "core forest"	Size of the biggest, connected forest patch within the MA (acres)	In general, how well connected are all the existing forest patches in the MA?	In general, how well connected are the existing patches of Core Forest in the MA?	What is the FWS's overall perceived adequacy of this colony's current habitat?	How much tree cover will be lost to direct/ indirect/ cumulative impacts? (acres)	Will I-69 run through the center of a known or likely roosting area within the MA?	Will any of the identified roosts (n=36) be directly destroyed by I-69?	Is it likely that a primary roost tree(s) will be directly lost?	Is it likely that a primary roost tree(s) will be indirectly lost?	Is a proposed interchange within the MA? If so, is it near the center of the MA?	Once I-69 is operational, are most forested areas in the MA likely to remain for another 50 years?	Is this colony likely to persist into the reasonably foreseeable future once I-69 and forest mitigation are done?	If displaced by I-69 &/or other development, is additional maternity habitat available nearby?
Pigeon Creek	15%	7%	1,139	POOR	FAIR	FAIR	10 / 1 / 279	NO	NO	NO	NO	YES/NO	UNCERTAIN	YES	YES
Patoka River	32%	17%	3,855	GOOD	GOOD	GOOD	20 / 0 / 24	NO	NO	NO	NO	NO	YES	YES	YES
Flat Creek	43%	34%	5,385	GOOD	GOOD	GOOD	76 / 0 / 6	NO	NO	UNK.	NO	NO	YES	YES	YES
East Fork	25%	7%	1,748	FAIR	POOR	FAIR	42 / 0 / 5	NO	NO	UNK.	NO	NO	YES	YES	YES
Veale Creek	19%	6%	1,423	FAIR	FAIR	FAIR	20 / 2 / 6	VERY CLOSE	NO	NO	NO	YES/NO	YES	YES	YES
West Fork (Elnora)	10%	2%***	303	GOOD	FAIR	FAIR	0 / 1 / 25	NO	NO	NO	NO	YES/NO	YES	YES	YES
Doans Creek	64%	33%	8,088	GOOD	GOOD	GOOD	84 / 3 / 3	NO	NO	NO	NO	NO	YES	YES	YES
Little Clifty Branch**	70%	26%	8,824	GOOD	GOOD	GOOD	252 / 8 / 16	YES	YES	YES	NO	YES/YES	YES	YES	YES
Plummer Creek	68%	34%	8,542	GOOD	GOOD	GOOD	207 / 1 / 5	NO	NO	NO	NO	NO	YES	YES	YES
Indian Creek	60%	22%	7,540	GOOD	GOOD	GOOD	315 / 9 / 26	CLOSE	NO	UNK.	NO	YES/NO	YES	YES	YES
Beanblossom Nature Preserve***	67%	39%	8,354	EXCELLENT	GOOD	GOOD	0 / 0 / 62	NO	NO	NO	NO	NO	YES	YES	YES
W. Fork (Bryant Creek)	37%	18%	4,091	GOOD	GOOD	GOOD	66 / 1 / 6	NO	NO	NO	NO	YES/NO	YES	YES	YES
Lambs Creek***	40%	19%	4,449	GOOD	GOOD	GOOD	7 / 0 / 36	NO	NO	NO	NO	YES/NO	YES	YES	YES
W. Fork (Clear Creek)	43%	18%	4,944	GOOD	GOOD	GOOD	99 / 0 / 26	YES	NO	UNK.	NO	YES/NO	YES	YES	YES
W. Fork (Crooked Creek)	30%	9%	3,046	GOOD	POOR	FAIR	170 / 0 / 44	NO	NO	NO	NO	NO	YES	YES	YES
W. Fork (Pleasant Run)	18%	2%	1,533	FAIR	POOR	FAIR	29 / 4 / 83	NO	NO	NO	NO	YES/NO	UNCERTAIN	YES	YES

* MA = maternity area
** New maternity colony found in 2010
***New colony found in 2012

Table B4. Updated Estimated levels of Incidental Take by stressor for Indiana bats during the Summer (2013).

Relevant Stressors to Bats in SAA (estimated through year 2030)	Estimated Amount or Area under Stress*	FEMALE AND JUVENILE BATS IN MATERNITY COLONY AREAS (160 bats/colony/year)																																MALES					Total Take	Likely Form(s) of Take[3]
		Pigeon Creek		Patoka River		Flat Creek		East Fork		Veale Creek		W. Fork (Elnora)		Doans Creek		Plummer Creek		Little Clifty Branch[4]		Indian Creek		Beanblossom Nature Preserve		W. Fork (Bryant Creek)		Lambs Creek		W. Fork (Clear Creek)		W. Fork (Crooked Creek)		W. Fork (Pleasant Run)		Take Subtotal	In WAA in summer		In remaining SAA[6]		Take Subtotal		
		E[1]	T[2]	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T		E	T	E	T			
I-69 Direct Impacts/Loss of Roosting Habitat (seasonal cutting restrictions observed so no direct killing anticipated)	1973 ac.	80	2	60	2	80	4	120	2	80	2	0	0	40	2	60	4	160	6	160	10	0	0	40	2	20	0	160	2	160	10	80	2	50	190	0	65	0	0	50	h
I-69 Direct Impact/Loss of Foraging Habitat/Connectivity	1973 ac.	80	2	60	2	80	1	120	2	60	2	0	0	40	0	60	1	160	2	160	4	0	0	40	0	20	0	160	1	160	2	80	0	19	190	3	65	1	4	23	h
Construction Noise/Vibrations causing bats to stress and flee roosts, ↑ risk of predation (while bats are present in adjacent areas)	-	80	1	60	1	160	2	120	2	160	3	0	0	40	1	60	1	160	2	160	2	0	0	40	0	20	0	160	1	160	2	80	1	19	190	3	65	1	4	23	H
Disturbance & Habitat Loss associated w/ Demolition and Relocation of 390 Homes & 76 Businesses (no timing restrictions)	unk.																																	40					5	45	H,w,k,h
Habitat loss from I-69 related Utility Relocations (seasonal restrictions will be in place so no direct mortality expected)[5]	Est. 225 ac. total for Sec. 1-6	0	0	80	0	80	0	80	0	80	0	0	0	80	1	80	1	80	1	80	1	0	0	80	1	20	0	80	1	80	1	80	1	8	6	0	6	0	0	8	H,h
Additional High-speed traffic / Roadkill (total roadkill/maternity colony from 2013 through 2030)	5% risk over 17 years	160	8	160	8	160	8	160	8	160	8	0	0	160	8	160	8	160	8	160	8	0	0	160	8	160	8	160	8	160	8	160	8	112	380	19	130	7	26	138	k
I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)	29 ac. in MAs	40	1	20	0	80	1	0	0	80	1	0	0	60	1	80	1	80	3	80	3	0	0	20	0	20	0	0	0	0	0	80	2	13	21	1	8	1	2	15	H,w,k,h
Increased levels of Disturbance/Vandalism of Roosting Bats in ungated Hibernacula during the summer	unk.																																	0	500	5	0	0	5	5	H, w, k
TOTAL of Direct and Indirect from I-69			14		13		16		14		16		0		13		16		22		28		0		11		8		13		23		14	**261**		31		10	**46**	**307**	
TOTAL Cumulative Effects (all sources through 2030)	692 ac in MAs	160	0	160	0	160	0	120	0	160	0	160	0	160	0	160	0	160	2	160	2	160	2	160	1	160	1	160	2	160	4	160	8	**22**	130	2	58	2	**4**	**26**	H,w,k,h
TOTALS Direct and Indirect + Cumulative			14		13		16		14		16		0		13		16		24		30		2		12		9		15		27		22	**283**		33		12	**50**	**333**	

Updated based on revised Appendix D of Sec. 5 BA

* with billboard impacts added in for Sec.5.

[1] E = estimated annual # of exposed bats (for colonies the maximum number exposed = 160/year; for adult males, densities were used to estimate potential exposure…with 0.17 males/impacted acre in the WAA and 0.085 males/acre in the SAA; density of males exposed was adjusted using 2009 population estimates, although these numbers are expected to fluctuate some from year to year.)

[2] T = maximum estimated number of exposed bats that may be taken from 2008-2030.

[3] H = harrass, w = wound, k = kill, and h = harm, which includes significant habitat modification or degradation resulting in death, or injury by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

[4] Gray shading = New maternity colony area identified in 2010 & 2012

[5] Utility locations have been confirmed for Sections 1 and 3 and will not occur within the maternity colony areas for those Sections

Table B5. Updated Estimated levels of Incidental Take by stressor for Indiana bats during spring, fall, and winter (2013).

Project Phase	Relevant Stressors to Bats in WAA (estimated through year 2030)	Estimated Amount or Area of Stressor	HIBERNACULA* in WAA																										Total Take of Bats†	Likely Form(s) of Take[3]
			E[1]	T[2]	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T		
	I-69 Direct Impacts/Loss of Roosting Habitat (seasonal cutting restrictions observed so no direct killing anticipated)	1234 ac.	58	0	30,496	16	7,849	4	218	0	31	1	48	1	86	1	18	0	17	0	1	0	48	0	49,617	0	23	h
	I-69 Direct Impact/Loss of Foraging Habitat/Connectivity	1234 ac.	58	0	30,496	0	7,849	0	218	0	31		48		86		18		17	0	1	0	48	0	49,617	0	0	h
	Construction Noise/Vibrations causing bats to stress and flee roosts, ↑ risk of predation (while bats are present in adjacent areas)	1234 ac.	58	0	30,496	0	7,849	0	218	0	31		48		86		18		17	0	1	0	48	0	49,617	0	0	H
	Disturbance & Habitat Loss from Demo. & Relocation of 390 Homes & 76 Businesses	unk.																									15	H,w,k,h
	Habitat loss from I-69 related Utility Relocations (seasonal restrictions/no direct take anticipated)	unk.	58	0	30,496	0	7,849	0	218	0	31	0	48	0	86	0	18	0	17	0	1	0	48	0	49,617	0	0	H,w,h
	Additional High-speed traffic / Roadkill (total from 2013 through 2030)	.25% risk over 17 years	58	0	30,496	76	7,849	20	218	1	31	0	48	0	86	0	18	0	17	0	1	0	48	0	49,617	124	221	k
	I-69 Indirect/Induced Loss of Roosting and Foraging Habitat (no restrictions/bats present)	70 ac.	58	0	30,496	0	7,849	0	218	0	31		48		86		18		17	0	1	0	48	0	49,617	1	1	H,w,k,h
	Increased risk levels of Winter Disturbance/Vandalism of Hibernating Bats in vulnerable Hibernacula[4]	1% increase in risk	58	1	30,496	0**	7,849	0**	218	2	31	0	48	0	86	1	18	0	17	0	1	0	48	0	49,617	496	501	H, w, k
TOTAL of Direct and Indirect from I-69				1		92		24		3		1		2		2		0		0		0		1		621	**761**	
	Cumulative Effects of Winter Disturbance/Vandalism of Hibernating Bats in vulnerable Hibernacula	1% over the span of 20+ years	58	1	30,496	0**	7,849	0**	218	2	31	1	48	1	86	1	18	0	17	0	1	0	48	0	49,617	496	502	H, w, k
	Cumulative Effects of ongoing Roadkill (total roadkill/hibernating pop. from 2013 through 2030)	.25% risk over 17 years	58	0	30,496	76	7,849	20	218	1	31	0	48	0	86	0	18	0	17	0	1	0	48	0	49,617	124	221	H, w, k
	Cumulative Effects of Forest Habitat Loss/Degradation, surrounding Hibernacula associated (through 2030)	1563 ac.	58	5	30,496	10	7,849	19	218	16	31	4	48	7	86	13	18	1	17	5	1	1	48	2	49,617	9	92	H,w,k,h
TOTAL of Cumulative				6		86		39		19		5		8		14		1		5		1		2		629	**815**	
TOTALS Direct and Indirect + Cumulative				7		178		62		22		6		10		16		1		5		1		3		1,250	**1,577**	

***** Ashcraft and Salamander caves were not included as they did not contain winter populations in 2009. Similarly, Ozzy's Hole Cave was not included as it was not analyzed in the BA Addendum since it was recently found and only contained 1 Indiana bat.

****** Permanent conservation easements have been placed on the property and these caves are no longer considered vulnerable to human disturbances

† We are assuming that half of the take would involve adult males and half adult females (i.e., 50:50 sex ratio and no sexual bias in probability of occurrence).

1 E = estimated annual # of exposed bats (used updated winter population numbers from 2011 and 2013 where available)

2 T = maximum estimated number of exposed bats that may be taken from 2008-2030.

3 H = harrass, w = wound, k = kill, and h = harm, which includes significant habitat modification or degradation resulting in death, or injury by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

4 Assumes worst-case scenario that cave owners will not allow their vulnerable caves to be gated.

Appendix B

Population Model Runs using the Thogmartin et al. 2013 model.

The scenario was run 10,000 times with and without the project. We assume WNS is present in the area in 2011 and population impacts begin in 2014 (model uses the Indiana bat specific assumptions). We assessed whether or not the take of 3 adult females and 12 pups from an occupied roost tree during private landowner harvests in the maternity colony area resulted in long-term fitness reductions for that colony.

	WITHOUT project (Scen2)	**WITH project (Scen1)**	**% Difference**
Median population size at year 50	0	0	**0**
Probability of extirpation by year 50	0.76	0.79	4.0
Probability of extirpation by year 25	0.46	0.51	9.0
Mean years to extirpation	23.5	24.0	2.0
Median years to extirpation	21	22	5.0
Median growth rate at year 50	0	0	0

Conclusion: Model projections of a maternity colony that begins with 80 females and 80 pups and loses 3 adult females and 12 pups in 1 year are similar with or without these losses. These model projections (using the Indiana bat assumptions for WNS) predict a 76 percent chance of extirpation by year 50 with the project and 79 percent chance without the project; the percent difference between the two scenarios at 25 years is higher, indicating that over time the project impacts are lessened. The years to extirpation with or without the project are very similar, and 0 growth rate is expected at year 50, with or without the project. WNS essentially drives the population to extirpation with the project having minimal impacts on the probability or time to extirpation.

Appendix C

INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

100 North Senate Avenue
Room N758
Indianapolis, Indiana 46204

PHONE: (317) 234-7248

Michael R. Pence, Governor
Brandye Hendrickson, Interim Commissioner

July 9, 2013

Important Message to Property Owners Regarding the Endangered Species Act

Dear Landowner:

The Indiana Department of Transportation (INDOT) is in the process of completing the environmental studies for Section 5 of the I-69 Evansville to Indianapolis Project and has begun survey work in the area near State Road 37. This letter is intended to help update property owners within the I-69 Section 5 study area (from Bloomington to Martinsville) of important information pertaining to the Endangered Species Act (ESA). You are receiving this letter because your property is in the study area that may be directly or indirectly impacted by the Project.

INDOT, in consultation with the U.S. Fish and Wildlife Service, continues to survey and identify sensitive habitat for the endangered Indiana bat (Myotis sodalis). Many of the properties in the vicinity of SR 37, the general alignment of Section 5 of the I-69 project, contain forests that are or can be habitat for the endangered Indiana bat.

Although the alignment for Section 5 is not finalized, some property owners may be considering tree harvesting activities on their property. INDOT recommends that property owners become aware of potential restrictions on timing and other regulatory requirements such as federal penalties prior to commencing such activities.

INDOT is complying with the requirements of the Endangered Species Act (16 U.S.C. 1531 et seq.) and other state and federal laws in undertaking the I-69 project. In accordance with the *Revised Tier 1 Biological Opinion*, and the *Tier 2 Biological Opinions* for Sections 1, 2, 3 and 4 of the I-69 project, and by agreement with the United States Fish and Wildlife Service (USFWS), INDOT is cutting or harvesting trees in conformity with the following restrictions:

- For Sections 1, 2 and 3 of the I-69 project, no cutting or harvesting between April 1 and September 30 of each calendar year. (The northern portion of I-69 Section 5 shares this restriction.)
- For Sections 4 and 5 of the I-69 project, no cutting or harvesting between April 1 and November 15 of each calendar year.

These cutting restrictions are designed to avoid possible harm to the endangered Indiana bat.

INDOT encourages all landowners and loggers to act in accordance with the cutting restriction above to avoid harm to the Indiana bat. Please contact the Bloomington field office USFWS at 812-334-4261 with any questions or concerns about compliance with the Endangered Species Act or the Indiana bat.

Please contact the I-69 Section 5 Project office to discuss the Project location or if you are considering a tree-harvesting activity between April 1 and November 15 if your property is within the I-69 Section 5 Project area. The Project office is staffed Monday-Friday or by appointment and can be reached at 812-334-8869.

Sincerely,

Sandra A. Flum

Sandra A. Flum
Project Manager

Appendix D

Conservation Measures

The following conservation measures were jointly developed by the FHWA, INDOT, and the Service during informal consultation and were subsequently incorporated into the Tier 1 BA and the Tier 1 BA Addendum as part of the official Proposed Action for the I-69 project. Since conservation measures are part of the Proposed Action, their implementation is required under the terms of the consultation. These measures were specifically designed to avoid and minimize impacts of the proposed action on Indiana bats and bald eagles and to further their recovery. **The Service has analyzed the effects of the Proposed Action based on the assumption that all conservation measures will be implemented or equivalent measures developed in consultation with the Service during or following Tier 2.** The beneficial effects of the following measures were taken into consideration for both our jeopardy and incidental take analyses.

INDIANA BAT (*Myotis sodalis*)

A. CONTEXT SENSITIVE SOLUTIONS

WINTER HABITAT

1. Alignment Planning - Efforts will be made to locate Interstate alignments beyond 0.5 miles from known Indiana bat hibernacula.

2. **Blasting -** Blasting will be avoided between September 15 and April 15 in areas within 0.5 miles of known Indiana bat hibernacula. All blasting in the Winter Action Area (WAA) will follow the specifications developed in consultation with the USFWS and will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of nearby caves serving as Indiana bat hibernacula.

3. Hibernacula Surveys – A plan for hibernacula surveys (caves and/or mines) will be developed and conducted in consultation with and approved by USFWS during Tier 2 studies.

4. Karst Hydrology – To avoid and minimize the potential for flooding, dewatering, and/or microclimate (i.e., temperature and humidity) changes within hibernacula, site-specific efforts will be made to minimize changes in the amount, frequency, and rate of flow of roadway drainage that enters karst systems that are determined to be hydrologically connected to Indiana bat hibernacula.

AUTUMN/SPRING HABITAT

5. Tree Removal – To minimize adverse effects on bat habitat, tree (three or more inches in diameter) cutting will be avoided within five miles of a known hibernaculum. If unavoidable, cutting will only occur between November 15 and March 31.

SUMMER HABITAT

6. Alignment Planning - Efforts will be made to locate Interstate alignments so they avoid transecting forested areas and fragmenting core forest where reasonable.

7. Tree Removal - Tree and snag removal will be avoided or minimized as follows:

a. Tree Cutting - To avoid any direct take of Indiana bats, no trees with a diameter of 3 or more inches will be removed between April 15 and September 15. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. In the median, outside the clear zone, tree clearing will be kept to a minimum with woods kept in as much a natural state as reasonable. Forested medians will be managed following IDNR State Forest timber management plan.

b. Mist Netting - In areas with suitable summer habitat for the Indiana bat, mist net surveys will be conducted between May 15 and August 15 at locations determined in consultation with the USFWS as part of Tier 2 studies. If Indiana bats are captured, some will be fitted with radio transmitters and tracked to their diurnal roosts for at least 5 days unless otherwise determined by USFWS.

8. Bridges – Bridges will include the following design features:

a. Surveys – The undersides of existing bridges that must be removed for construction of I-69 will be visually surveyed and/or netted to determine their use as night roosts by Indiana bats during the summer.

b. Bat-friendly bridges – Where feasible and appropriate, Interstate and frontage road bridges will be designed to provide suitable night roosts for Indiana bats and other bat species in consultation with the USFWS.

c. Floodplains – Where reasonable and appropriate, floodplains and oxbows will be bridged to protect environmentally sensitive areas. The Patoka River floodplain will be bridged in its entirety, thus minimizing impacts to many different habitats.

9. Stream Relocations – Site-specific plans for stream relocations will be developed in design considering the needs of sensitive species and environmental concerns. Plans will include the planting of woody and herbaceous vegetation to stabilize the banks. Such plantings will provide foraging cover for many species. Stream Mitigation and Monitoring plans will be developed for stream relocations, as appropriate.

ALL HABITATS

10. Medians and Alignments – Variable-width medians and Independent alignments will be used where appropriate to minimize impacts to sensitive and/or significant habitats. Context sensitive solutions will be used, where possible. This may involve vertical and horizontal shifts in the Interstate.

11. Minimize Interchanges - Efforts have been made to limit interchanges in karst areas, thereby limiting access and discouraging secondary growth and impacts. In Tier 2, further consideration will be given to limiting the location and number of interchanges in karst areas.

12. Memoranda of Understandings (MOUs) - Construction will adhere to the Wetland MOU (dated January 28, 1991) and Karst MOU (dated October 13, 1993). The Wetland MOU minimizes impacts to the Indiana bat by mitigating for wetland losses, and creating bat foraging areas at greater ratios than that lost to the project. The Karst MOU avoids and minimizes impacts to the Indiana bat by numerous measures which protect sensitive karst features including hibernacula.

13. Water Quality - Water contamination will be avoided/minimized by the following:

a. Equipment Service - Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.

b. Roadside Drainage - Where appropriate in karst areas, roadside ditches will be constructed that are grass-lined and connected to filter strips and containment basins.

c. Equipment Maintenance - Construction equipment will be maintained in proper mechanical condition.

d. Spill Prevention/Containment – The design for the roadway will include appropriate measures for spill prevention/containment.

e. Herbicide Use Plan - The use of herbicides will be minimized in environmentally sensitive areas, such as karst areas that are protective of Indiana bats and their prey. Environmentally sensitive areas will be determined in coordination with INDOT and, as appropriate, INDOT consultants. Appropriate signage will be posted along the interstate to alert maintenance staff.

f. Revegetation - Revegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be utilized beyond the clear zone. Revegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers, as appropriate, similar to the native seed mixes of other nearby states.

g. Low Salt Zones – A low salt and no spray strategy will be developed in karst areas for this project. A signing strategy for these items will also be developed. The low salt zones will be determined in coordination with INDOT.

h. Bridge Design – Where feasible and appropriate, bridges will be designed with none or a minimum number of in-span drains. To the extent possible, the water flow will be directed towards the ends of the bridge and to the riprap drainage turnouts.

14. Erosion Control - Temporary erosion control devices will be used to minimize sediment and debris. Timely revegetation after soil disturbance will be implemented and monitored. Revegetation will consider site specific needs for water and karst. Erosion control measures will be put in place as a first step in construction and maintained throughout construction.

15. Parking and Turning Areas – Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing, and will avoid environmentally sensitive areas, such as karst.

16. Avoid and minimize impacts from private landowner harvests within the right of way - The goal of the measure is to avoid and minimize impacts from private landowner harvests by working with property owners within the right of way who plan to harvest their property. FHWA and INDOT propose to develop an voluntary agreement with the interested landowners, such as a "right of entry" agreement or other type of covenant, to pay the landowner to limit the time of year in which they harvest their property; this time period would be limited to the late fall and winter when Indiana bats are not present in the forested areas.

B. RESTORATION / REPLACEMENT

SUMMER HABITAT

1. Summer Habitat Creation / Enhancement - Indiana bat summer habitat will be created and enhanced in the Action Area through wetland and forest mitigation focused on riparian corridors and existing forest blocks to provide habitat connectivity. The following areas and possibly others will be investigated for wetland and forest mitigation to create and enhance summer habitat for the Indiana bat: Pigeon Creek, Patoka River bottoms, East Fork of the White River, Thousand Acre Woods, White River (Elnora), First Creek, American Bottoms, Garrison Chapel Valley, Beanblossom Bottoms, White River (Gosport), White River (Blue Bluff), and Bradford Woods. In selecting sites for summer habitat creation and enhancement, priority will be given to sites located within a 2.5 mile radius from a recorded capture site or roost tree. If willing sellers cannot be found within these areas, other areas may be used as second choice areas as long as they are within the Action Area and close enough to benefit these maternity colonies, or are outside the Action Area but still deemed acceptable to the USFWS. Where appropriate, mitigation sites will be planted with a mixture of native trees that is largely comprised of species that have been identified as having relatively high value as potential Indiana bat roost trees. Tree plantings will be monitored for five years after planting to ensure establishment and protected in perpetuity via conservation easements.

2. Wetland MOU - Wetlands will be mitigated at ratios agreed upon in the Wetland MOU (dated January 28, 1991). Wetland replacement ratios are as follows:
a. Farmed 1 to 1
b. scrub / shrub and palustrine / lacustrine emergent 2 - 3 to 1 depending upon quality
c. bottomland hardwood forest 3 – 4 to 1 depending upon quality
d. exceptional, unique, critical (i.e. cypress swamps) 4 and above to 1 depending upon quality.

3. Forest Mitigation - The Tier 1 Forest and Wetland Mitigation and Enhancement Plan identifies the general location of potential mitigation sites for upland and bottomland forests. Preference will be given to areas contiguous to large forested tracts that have recorded federal and state listed species. The actual mitigation sites implemented will be determined in or following Tier 2 in consultation with the Service and other environmental review agencies. Coordination with the environmental review agencies will assure that these forest mitigation sites are strategically situated in biologically attractive ecosystems. Forest impacts will be mitigated at a ratio of 3 to 1. All forest mitigation lands will be protected in perpetuity via conservation easements. The 3:1

forest mitigation may not be located entirely within the Action Area. Forest impacts occurring within each of the 13 2.5-mile radius maternity colony areas would be mitigated by replacement (i.e. planting of new forest and purchase of existing) at approximately 3:1, preferably in the vicinity of the known roosting habitat.

C. CONSERVATION / PRESERVATION

WINTER HABITAT

1. Hibernacula Purchase - Opportunities will be investigated to purchase at fair market value from “willing sellers,” an Indiana bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and implementation of all management efforts, the hibernaculum(a) and all buffered areas will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

2. Hibernacula Protection – With landowner permission, investigations will be coordinated with the USFWS on acquiring easements to erect bat-friendly angle-iron gates at cave entrances. These gates prevent unauthorized human access and disturbance of hibernacula, while maintaining free airflow within the hibernacula within the Action Area. Gates will be constructed according to designs from the American Cave Conservation Association. Effects of gates on water flow and flash flooding debris will be carefully evaluated before and after gates are installed. Other structures (e.g., perimeter fencing) or techniques (e.g., alarm systems and signs) may also be used.

AUTUMN/SPRING HABITAT

3. Autumn/Spring Habitat Purchase - Any hibernaculum(a) purchased as part of conservation for Indiana bat winter habitat will include associated autumn swarming/spring staging habitat to the maximum extent practicable. Any purchase will be from a willing seller at fair market value. In addition, some parcels containing important autumn swarming/spring staging habitat may be acquired near key hibernacula regardless of whether the hibernacula are acquired themselves. Any acquired autumn swarming/spring staging habitat would be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. The purchase of forest would be included as part of the 3:1 mitigation in Measure B.3.

SUMMER HABITAT

4. Summer Habitat - Investigations will be coordinated with the USFWS on purchasing lands at fair market value in the Action Area from “willing sellers” to preserve summer

habitat. Any acquired summer habitat area would be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

D. EDUCATION / RESEARCH / MONITORING

WINTER HABITAT

1. Monitor Gated Caves - All caves that have gates erected as mitigation for this project will have their temperature, humidity, bat activity and populations monitored before and for three years after gate installation. Infra-red video monitoring or other techniques deemed acceptable by USFWS will be conducted for a minimum of two nights in the appropriate season at each newly installed cave gate to ensure the bats are able to freely ingress and egress. Data acquisition will use a number of data loggers minimizing the need for entry into these caves. All precautionary measures will be taken to minimize potential impacts to hibernating Indiana bats.

2. Cave Warning Signs - Where deemed appropriate by USFWS, the following may be done: signs will be posted that warn the public and discourage cave entry at hibernacula within/near the Action Area. Signs should be placed so that they do not block air flow into the cave and do not draw attention to the entrance and attract violators (USFWS 1999). Also, light-sensitive data loggers may be placed within the caves to assess the effectiveness of the warning signs at deterring unauthorized entries. Permission from the landowners must be obtained before erecting such signs and installing data loggers.

3. Biennial Census – Total funding of $50,000 will be provided to supplement the biennial winter census of hibernacula within/near the proposed Action Areas. Funding will be made available in consultation with the USFWS.
Status Report – To be completed.

AUTUMN/SPRING HABITAT

4. Autumn/Spring Habitat Research - Total funding of $125,000 will be provided for research on the relationship between quality autumn/spring habitat near hibernacula and hibernacula use within/near the Action Area. This research should include methods attempting to track bats at longer distances such as aerial telemetry or a sufficient ground workforce. A research work plan will be developed in consultation with the USFWS. Funding will be made available as soon as practical after Notice to Proceed is given to the construction contractor for the applicable Tier 2 Section (or earlier).

SUMMER HABITAT

5. Mist Netting - A work plan for surveying, monitoring, and reporting will be developed and conducted in consultation with and approved by USFWS. This mist netting effort will be beyond the Tier 2 sampling requirements. Fifty mist netting sampling sites are anticipated. Monitoring surveys focused at each of the 13 known maternity colonies will be completed the summer before construction begins in a given section and will continue each subsequent summer during the construction phase and for at least five summers after construction has been completed. If Indiana bats are captured, radio transmitters will be used in an attempt to locate roost trees, and multiple emergence counts will be made at each located roost tree. These monitoring efforts will be documented and summarized within an annual report prepared for the Service.

GENERAL

6. Educational Poster - Total funding of $25,000 will be provided for the creation of an educational poster or exhibit and/or other educational outreach media to inform the public about the presence and protection of bats, particularly the Indiana bat. Funding would be provided after a Notice to Proceed is issued for construction of the first section of the project.

7. Rest Areas - Rest areas will be designed with displays to educate the public on the presence and protection of sensitive species and habitats. Attractive displays near picnic areas and buildings will serve to raise public awareness as they utilize the Interstate. Information on the life history of the Indiana bat, protecting karst, and protecting water quality will be included in such displays.

8. Access to Patoka NWR - If reasonable, an interchange will be constructed that would provide access to a potential Visitor's Center at the Patoka River National Wildlife Refuge.

9. GIS Information - GIS maps and databases developed and compiled for use in proposed I-69 planning will be made available to the public. This data provides information that can be used to determine suitable habitats, as well as highlight other environmental concerns in local, county, and regional planning. Digital data and on-line maps are being made available from a server accessed on the IGS website at IU: http://igs.indiana.edu/arcims/statewide/index.html. In addition, detailed GIS forest data (five meter resolution) has been developed for the 13 maternity colony foraging areas (circles with 2.5 mile radius) and WAA. This data was developed in order to better determine habitat impacts to the Indiana bat. This is the most accurate and detailed forest data known to exist for those areas. This data could potentially be used by USFWS, other government agencies, or students to examine effects on the Indiana bat, other species, or ecosystems over time.

U.S. Department
of Transportation
**Federal Highway
Administration**

Indiana Division

575 N. Pennsylvania Street, Room 254
Indianapolis, IN 46204
317-226-7475

May 20, 2013

In Reply Refer To:
HAD-IN

Mr. Scott Pruitt, Supervisor
U.S. Fish & Wildlife Service
Bloomington Field Office
620 South Walker Street
Bloomington, Indiana 47403-2121

Dear Mr. Pruitt:

The Federal Highway Administration (FHWA) and the project applicant, Indiana Department of Transportation (INDOT) request that the U.S. Fish and Wildlife Service (Service) reinitiate formal consultation on the Evansville to Indianapolis I-69 project (Tier 1) for the Indiana bat (*Myotis sodalis*).

FHWA, in cooperation with INDOT, completed a Tier 1 Final Environmental Impact Statement (FEIS) for the proposed Indianapolis to Evansville I-69 Project in December 2003. The FEIS evaluated five alternative routes and their associated variations through the southwestern portion of Indiana. FHWA issued a Record of Decision (ROD) for the project on March 24, 2004, selecting Alternative 3C, which traverses portions of Gibson, Warrick, Pike, Daviess, Greene, Monroe, Morgan, Johnson, and Marion counties in Indiana.

During the Tier 1 study, FHWA engaged in Section 7 consultation with the Service. FHWA submitted a draft Biological Assessment (BA) to the Service on March 26, 2003. The BA analyzed impacts of the I-69 Project on three listed species: the Indiana bat, bald eagle, and eastern fanshell mussel. The Service provided comments on the Draft BA to FHWA and INDOT on May 30, 2003. FHWA revised the BA and submitted the Final BA to the Service on July 18, 2003. On December 3, 2003, the Service issued the Tier 1 Biological Opinion (Tier 1 BO), concluding that the project was not likely to adversely affect the eastern fanshell mussel, and that any effects to the Indiana bat and bald eagle were not likely to jeopardize the continued existence of these species.

In 2004 and 2005, FHWA and INDOT completed field surveys for the Indiana bat along the approved project corridor that identified thirteen (13) maternity colonies and two hibernacula not previously identified in the BA or by the Service. FHWA prepared an Addendum to the Tier 1 BA and submitted it to the Service on March 7, 2006, together with a request to reinitiate formal consultation in order to evaluate the new information relating to the Indiana bat. After considering the information in the BA Addendum, the Service issued a Final Tier 1 Revised BO on August 24, 2006. In the Tier 1 Revised BO, the Service affirmed its previous conclusion that the I-69 Project was not likely to jeopardize the continued existence of the species.

In 2010, pre-construction mist netting captured a male Indiana bat in Section 4. Radio-telemetry showed this bat roosting in two live trees and a snag. The snag was located within the proposed right-of-way. Roost tree emergence counts showed this snag to be a primary roost. As recommended by the Service, FHWA and INDOT established the Little Clifty Branch Maternity Colony at this location which is southwest of SR 45. On April 11, 2011 FHWA requested re-initiation of formal consultation on the Tier 1 Revised BO because of this finding. On May 25, 2011 USFWS issued an Amendment to the Tier 1 Revised BO. This Amendment addressed the additional colony (a total of 14 colonies) as well as new information that was available on white nose syndrome.

FHWA has also completed formal consultation for four Tier 2 Projects. The Service has reviewed Tier 2 BAs on Sections 1, 2, 3 and 4 and has issued Tier 2 BOs for each of those projects, concluding that the potential impacts of each of the four projects to the Indiana bat are consistent with the impacts predicted in the Tier 1 Revised BO (for Sections 1, 2, 3, which were completed prior to the Amendment) and Amendment to the Tier 1 Revised BO (for Section 4, which was completed after the Amendment), and that these Tier 2 Sections were not likely to jeopardize the continued existence of the Indiana bat. The FHWA has issued a ROD for Sections 1, 2, 3 and 4. At this time, most of the forest cover within the right-of-way for these Sections has been removed and Sections 1, 2, and 3 are open to traffic. Currently, construction is still ongoing in Section 4 within portions of Greene and Monroe Counties.

FHWA also has requested formal consultation on the fifth Tier 2 Project, Section 5, with the submittal of the Section 5 Tier 2 BA on December 19, 2012.

Upon the recommendation of the Service, FHWA is requesting the re-initiation of formal Tier 1 Section 7 consultation regarding the Indiana bat (*Myotis sodalis*), followed by issuance of a Tier 2 BO for Section 5. The re-initiation of Tier 1 Section 7 consultation is requested for the following three items:

1. Additional Maternity Colonies
2. Exempted Levels of Take
3. Documentation for Private Property Owner Tree Clearing in Section 4

<u>Additional Maternity Colonies</u>

As stated in the Section 5 Tier 2 BA, Indiana bat presence surveys in 2012 captured a pregnant female Indiana bat in Section 5. Radio-telemetry showed this bat roosting in two snags. Roost tree emergence counts showed these snags to be primary roosts. As recommended by the Service, FHWA and INDOT established the Lambs Creek Maternity Colony at this location which is west of Martinsville.

In addition to the bat surveys that were completed for I-69, the Service conducted a bat survey for the Sycamore Land Trust at the Beanblossom Bottoms Nature Preserve. Three Indiana bats were captured and tracked to three different roosts. As recommended by the Service, FHWA and INDOT included the Beanblossom Bottoms Nature Preserve Maternity Colony in the Section 5 BA.

The addition of these two new maternity colonies in Section 5 brings the entire I-69 total to 16 Indiana bat maternity colonies along the project.

<u>Exempted Levels of Take</u>

Exempted levels of take for forest and wetlands were developed in Tier 1 based on right-of-way impact estimates at that time. These exempted levels of take were included in the Tier 1 Revised BO and the Amendment to the Tier 1 Revised BO. Based on more up-to-date information on project impacts, some of these exempted levels of take are being approached or exceeded. This is primarily due to estimated impacts due to relocations of utilities and billboards which were not included in the original Tier 1 Revised BO thresholds. The levels of take requested below provide a more refined estimate that takes into account the additional utility and billboard impacts. FHWA is requesting the following increases in exempted level of take for habitat impacts:

Tier 1 Non-forested Wetlands

In the Tier 1 Revised BO the exempted level of take for non-forested wetlands was 20 acres. Current estimates (including all Sections) show a total of 27.7 acres of non-forested wetland impacts, which exceeds this exempted level of take. FHWA and INDOT would like to request an increase in this exempted level of take to 30 acres of non-forested wetland impacts to account for uncertainty related to future impacts. FHWA and INDOT will continue to minimize and avoid impacts to all wetland types. It is noted that the total wetland impacts including all types have been reduced from the total Tier 1 BA Addendum estimate of 120 acres to a current estimate of 63 acres. Current wetland impact estimates are approximately half of the Tier 1 BA estimate, with the reduction primarily to forested wetlands.

Section 5 Total Forest

The Tier 1 exempted level of take for total forest for Section 5 is 303 acres. This did not include utility or billboard impact estimates. Estimates in Section 5 show 254.57 acres of total forest impacted by the Draft Environmental Impact Statement (DEIS) Preferred Alternative right-of-way. An additional 75 acres of forests are estimated to be impacted by utility relocations. Also, an additional 15 acres of forests are estimated to be impacted by billboard relocations and to accommodate access to them. This totals approximately 345 acres, which exceeds the 303 acre exempted level of take. The entire project has been below the estimated total impacts assumed in the Tier 1 Revised BO. In Sections 1 – 4, project right-of-way and utility impacts are approximately 146 acres below the Tier 1 Revised BO thresholds which only included right-of-way estimates. Adding the additional 42 acres over the limit assumed in the Tier 1 Revised BO for Section 5, then overall the Project has affected 105 fewer acres than assumed in the Revised Tier 1 BO. FHWA and INDOT would like to request an increase in this exempted level of take to 350 acres of total forest impacts for Section 5 to account for uncertainty related to future utility impacts.

Tier 1 Hibernacula Forest

Individual hibernacula Winter Action Area (WAA) circles have their own Tier 1 exempted levels of take. Additionally, FHWA and INDOT are concerned that right-of-way and future utility impacts could cause these exempted levels of take to be exceeded for some of the hibernacula in Section 5. FHWA and INDOT would like to request the hibernacula exempted levels of take increases listed below to account for uncertainty related to future utility impacts. Please see Table 1 (attached) showing the current hibernacula impacts including DEIS Preferred Alternative 8 right-of-way, utility, and billboard estimates. The following hibernacula WAA circle impacts approach or exceed the take presented in the Tier 1 Revised BO. The requested level of take listed below was determined by adding 10 acres to the estimated impacts and rounding up to the nearest 5 acres. Please note the impact acreages noted below are not additive because there is significant overlap of the hibernacula WAA circles.

Hibernaculum WAA	Estimated Impacts	Requested Level of Take
	293.87 ac	305 ac
	111.5 ac	125 ac
	99.26	110 ac

	262.01 ac	275 ac
	57.03 ac	70 ac
	84.26 ac	95 ac

Private Property Owner Tree Harvesting Activities in Section 4

Prior to INDOT's land acquisition activities for the Section 4 project, some private landowners chose to harvest trees on their land. This harvest activity occurred both within the area to be acquired by INDOT as part of the right-of-way for the project and some activity occurred outside of the planned right-of-way. Neither FHWA nor INDOT approved, consented to or condoned harvesting activities on the private land involved. The project does not have access to the private property where harvesting activity reportedly occurred to document the extent of private enterprise. In March 2011, INDOT sent out a letter to all registered logging companies to curtail any distribution of misinformation regarding tree harvesting. These letters indicated that seasonal tree-clearing guidelines had been adopted by INDOT for the entire project area in order to protect the Indiana bat and encouraged all logging companies and local landowners to adhere to these guidelines and to contact the USFWS for more information. In April 2011 INDOT posted an open letter to land owners on the I-69 project website. The letter discouraged tree clearing outside of the dates in INDOT's environmental commitment. Subsequently in June 2011, the USFWS issued a letter to all local landowners in Section 4 advising them of the presence of the Indiana bat in the area and ways to avoid potentially taking the species (Please note these letters are included in Appendix C of the Section 4 Tier 2 BO). In addition, the Section 5 Tier 2 BA includes the following commitment, "Should USFWS so desire, INDOT and FHWA will assist USFWS in distributing letters to the property owners in the Section 5 corridor designed to increase awareness of the impact of tree harvesting on Indiana bats. INDOT will also send a letter to each property owner in the right-of-way, stating that INDOT is not working with any logging companies in the development of I-69. It is anticipated that these letters would be distributed in early 2013 to assure owners are informed early in the process. This information should prevent any confusion on the part of the landowners that INDOT advocates, condones or permits logging on the property prior to the time when INDOT purchases the property for the Project. INDOT and FHWA will also work with USFWS to identify logging activities within the project area, and INDOT will notify USFWS of any logging activity discovered. This notice will allow USFWS to take appropriate action under the ESA as warranted."

The USFWS, during ongoing consultation and meetings with FHWA, has stated that USFWS has determined that it must consider the impact of harvest activities conducted by private property owners on their property prior to acquisition of the property by INDOT as part of the Tier 1 baseline and jeopardy analysis. FHWA has attempted to gather information relating to this pre-acquisition harvest activity as requested by USFWS. The information on this type of harvest activity has been developed through the following methods: reviews and before/after comparisons of aerial photography dated 2005, 2008, 2010, and 2011 (via *Google Earth* and *Bing Maps*) to estimate the extent of forested acreage on the parcels, conversations with property owners, and observations of tree harvesting and logging trucks on proposed and publicly-owned right-of-way by technical field staff.

Tables 2 and 3 (attached) contain the results of this information gathering exercise. The number of acres estimated to be harvested have not been confirmed in the field. Without access to the private land, information in the tables is based on an assumption that the entire deeded parcels were treated uniformly by the private owners, so if logging occurred on a portion of the parcel, the entire forested portion of the parcel is included in the table regardless of the amount of harvesting present. The numbers in the table should be considered the maximum-estimate of acres affected by timber harvest reported in the area. Table 2 shows the estimated acres within the proposed right-or-way and outside of the proposed right-of-way for the parcels with forest acreage reportedly harvested. Table 3 shows the estimated forest acreage potentially harvested by Indiana bat maternity colony. Tables 2 and 3 include estimated impacts by selective cut and clear cut. For the purposes of this attempt to estimate harvest activities, the term selective cut indicates that individual trees were harvested from the property. Coordination with Jeremiah Lemmon, the Greene County IDNR District Forester, estimates that for the selective harvesting in the vicinity of the project, an average of 20 trees per acre were harvested or approximately 4.5% of the trees per affected acre (an average 444 growing stock trees per acre as estimated based on US Forest Service's "Indiana Forests in 1998"). It is important to note the data in Tables 2 and 3 are only estimates.

Upon the recommendation of the Service, FHWA is requesting the Re-Initiation of formal Tier 1 Section 7 consultation regarding the Indiana bat (*Myotis sodalis*). Because the new information triggering this request for re-initiation does not relate to either the eastern fanshell mussel (*Cyprogenia stegaria*) or the bald eagle (*Haliaeetus leucocephalus*), we also request that you confirm that the findings in the Revised Tier 1 BO relating to those species remain unchanged. Due to this request for re-initiation of formal consultation on the Tier 1 Revised BO and Amendment, FHWA and INDOT acknowledge that the schedule for the Tier 2 formal consultation for Section 5 that is currently underway will need to be extended. Based on our recent coordination, FHWA and INDOT agree that the completion date for the Section 5 formal consultation should be extended to June 14, 2013. Timeframes can be discussed further with USFWS during the consultation process.

Please send your response to the undersigned with a copy to Tom Cervone, Ph.D., Bernardin, Lochmueller & Associates, Inc., 6200 Vogel Rd., Evansville, IN 47715. Thank you for your time and consultation.

Sincerely,

Karen A Bobo

Karen A. Bobo
Acting Division Administrator
Federal Highway Administration-Indiana Division

cc: Ms. Laura Hilden (INDOT)
Mr. Tim Miller (BLA, Indianapolis)

Table 1. Hibernacula Impacts as of February 2, 2013									
Cave	Section 5 ROW Impacts	Section 5 Utility Forest (75 acres)	Section 5 Billboard Forest	Section 5 Total Forest	Total Forest Acres	T1RPBO	TIRPBO with 10% threshold	T1RPBO Remaining Acreage	TIRPBO with 10% threshold Remaining Acreage
	0	0	0	0	452.52	431	474.10	-21.52	21.58
	28.47	11.16	2.94	42.57	293.87	288	316.80	-5.87	22.93
	11.24	5.33	0.42	16.99	111.5	97	106.70	-14.5	-4.80
	27.19	10.25	2.94	40.38	99.26	98	107.80	-1.26	8.54
	14.13	5.26	0.42	19.81	262.01	238	261.80	-24.01	-0.21
	28.47	11.21	2.94	42.62	346.13	350	385.00	3.87	38.87
	0	0	0	0	556.98	631	694.10	74.02	137.12
	0	0	0	0	498.49	556	611.60	57.51	113.11
	0	0	0	0	12.76	11.8	12.98	-0.96	0.22
	27.91	10.4	0.42	38.73	404.56	463	509.30	58.44	104.74
	32.47	11.42	0	43.89	84.26	85	93.50	0.74	9.24
	39.13	13.91	0	53.04	320.65	327	359.70	6.35	39.05
	0	0	0	0	431.72	522	574.20	90.28	142.48
	0	0	0	0	0	0	0.00	0	0.00
	0	0	0	0	57.03	51	56.10	-6.03	-0.93

Table 2. Private Land Potentially Harvested (Based on Forested Acreage on Total Parcel)				
	Number of Parcels with Some Harvesting	Number of Forested Acres on Parcels with Some Harvesting	Number of Harvested Forest Acres within R/W	Number of Forested Acres Outside of R/W (Potentially Harvested)
Selective Cut	35	1,530	360	1,170
Clear Cut	3	130	35	95
Total	38	1,660	395	1,265

Note: The information on this type of harvest activity has been developed through the following methods: reviews and before/after comparisons of aerial photography dated 2005, 2008, 2010, and 2011 (via Google Earth and Bing Maps) to estimate the extent of forested acreage on the parcels, conversations with property owners, and observations of tree harvesting and logging trucks on proposed and publicly-owned right-of-way by technical field staff. In the before/after comparisons in the majority of the parcels identified as selectively harvested, there is not a significant difference between the 2005 and 2011 aerial photography. These acres were not confirmed in the field as the property is privately held.

Table 3. Private Land Potentially Harvested within the Maternity Colonies (Based on Forested Acreage on Total Parcel)		
Maternity Colony and Logging Type	**Total of Forested Acres**	**Total of Forested Acres outside of ROW**
Doan's Selective Cut	80	60
Doan's Clear Cut	0	0
Plummer Selective Cut	230	175
Plummer Clear Cut	0	0
Little Clifty Selective Cut	610	485
Little Clifty Clear Cut	55	40
Indian Creek Selective Cut	230	150
Indian Creek Clear Cut	65	40
Total	***1,270***	***950***

Note: The information on this type of harvest activity has been developed through the following methods: reviews and before/after comparisons of aerial photography dated 2005, 2008, 2010, and 2011 (via Google Earth and Bing Maps) to estimate the extent of forested acreage on the parcels, conversations with property owners, and observations of tree harvesting and logging trucks on proposed and publicly-owned right-of-way by technical field staff. In the before/after comparisons in the majority of the parcels identified as selectively harvested, there is not a significant difference between the 2005 and 2011 aerial photography. These acres were not confirmed in the field as the property is privately held.

Table 4. Comparison of Revised Tier 1 BO and Tier 2 Forest Impacts			
Section	**Forest Impacts in ROW (acres) (Revised Tier 1 BO, Table 3)**	**Forest Impacts* (acres)**	**Difference**
1	55	34	21
2	280	243	37
3	112	73	39
4	1132	1037	95
5	303	229	74
6	266	266	0
TOTAL	**2148**	**1882**	**266**

Note: While there has been some logging of private lands on parcels adjacent to the I-69 ROW, the reduction in forest impacts resulting from the refined alternatives chosen for each of the 5 Sections for which an FEIS has been prepared off-sets acreage impact that may have occurred as a result of the private owners clear cutting their forest. Thus, it would appear that the impacts of private logging are consistent with the level of impact assumed in the Revised Tier 1 BO.

* Sections 1-4 have been updated with the most current design information, and include upland forest within the ROW plus forested wetland impacts. Section 5 includes total forest impacted in the ROW in the FEIS. Section 6 reflects the same number that was estimated in the Tier 1 BA Addendum.

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

June 11, 2013

Ms. Karen A. Bobo
Acting Division Administrator
U.S. Department of Transportation
575 North Pennsylvania Street, Room 254
Indianapolis, Indiana 46204

Dear Ms. Bobo:

The U.S. Fish and Wildlife Service (FWS) has reviewed the Federal Highway Administration's (FHWA) May 20, 2013 request for reinitiation of consultation for the Evansville to Indianapolis 1-69 project (Tier 1) for the Indiana bat (*Myotis sodalis*). As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action (e.g., highway construction and associated development) are subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Pursuant to information provided in your Tier 2 Biological Assessment (BA) for Section 5 of the I-69 Indianapolis to Evansville highway extension project and new information regarding potential increases in habitat impacts, the U.S. Fish and Wildlife Service (FWS), Bloomington, Indiana Field Office will reevaluate the Tier 1 Revised Programmatic Biological Opinion (RPBO) dated August 24, 2006 and the 2011 Amendment to the RPBO and provide a second amendment to the document. The decision to amend the current Tier 1 opinion (including the 2011 Amendment) is primarily based on: 1) new impact information related to utility and billboard relocations in Section 5 which stretches from SR 37 on the south side of Bloomington in Monroe County to just south of SR 39, south of Martinsville in Morgan County; 2) the discovery of two new Indiana bat maternity colonies within the right of way of Section 5; 3) more accurate wetland delineation data which has revealed additional non-forested wetland impacts not realized using the Tier 1 data; and 4) information related to private landowner tree-clearing in Section 4 of the project. Overall, forest and wetland impacts due to project construction have been reduced since the Tier 1 evaluation.

In light of the new information, the FWS is reinitiating formal Section 7 consultation in order to reevaluate the current impacts to the species and provide a second amendment to the 2006 Revised Tier 1 Biological Opinion (BO) and Incidental Take Statement (ITS). This reinitiation pertains only to the Indiana bat (*Myotis sodalis*) and our former opinion regarding the fanshell mussel (*Cyprogenia stegaria*) and bald eagle (*Haliaeetus leucocephalus*) remains unchanged.

Due to new impact information and the need for reinitiation on the Tier 1 BO and 2011 Amendment, consultation on the Section 5 Tier 2 biological assessment has been delayed. The FWS will complete the request to re-initiate consultation at the Tier 1 level, prior to issuing a Tier 2 biological opinion for Section 5 of the project. We hope to complete the Tier 1 reinitiation by July 10, 2013 and then follow up with the completed Tier 2, Section 5 opinion on or before July 17, 2013.

We look forward to continued cooperation with your agency to conserve our Nation's threatened and endangered species. If you have any questions, please contact Robin McWilliams Munson of my staff at 812-334-4261 x. 207.

Sincerely,

Scott E. Pruitt
Field Supervisor

Cc: Tom Cervone, BLA Inc., 6200 Vogel Road, Evansville, IN 47715

FILE COPY

United States Department of the Interior

Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

April 1, 2015

Mr. Richard Marquis
Division Administrator, Indiana Division
U.S. Department of Transportation
Federal Highway Administration
575 North Pennsylvania Street, Room 254
Indianapolis, IN 46204

Dear Mr. Marquis:

This enclosed document transmits the U.S. Fish and Wildlife Service's conference opinion for the construction, operation, and maintenance of the proposed Interstate 69 (I-69) extension from Evansville to Indianapolis and its anticipated effects to the northern long-eared bat (*Myotis septentrionalis*). The species status will be listed as "threatened" under the Endangered Species Act, effective May 4, 2015.

Our conference opinion is based on information provided in your biological assessment dated October 10, 2014, field visits, meetings, and other information on this on-going project available in our files. These comments have been prepared in accordance with Section 7 of the Endangered Species Act of 1973, as amended. Our comments are consistent with the intent of the National Environmental Policy Act of 1969 and the U. S. Fish and Wildlife Service's Mitigation Policy.

Sincerely,

Scott E. Pruitt
Field Supervisor

Enclosure

Cc (via email):

Michelle Allen, FHWA-Indiana Division
Laura Hilden, INDOT
Sandra Flum, INDOT
Tom Cervone, BLA
Jason Dupont, BLA
IDNR, Wildlife Diversity Section
Deborah Snyder, USCOE, Louisville District
Ken Westlake, USEPA, Region 5
Virginia Laszewski, USEPA, Region 5
Matt Buffington, IDNR, Division of Water
Jason Randolph, IDEM
Jennifer Szymanski, USFWS, Region 3

ES: RMunson/812-334-4261

TIER 1
BIOLOGICAL ASSESSMENT (BA)
Addendum - For the Northern Long-Eared Bat

Interstate 69 (Evansville to Indianapolis)

Volume 1

October 10, 2014

INDIANA DEPARTMENT OF TRANSPORTATION INDOT

U.S. Department of Transportation
Federal Highway Administration

U.S. Department of Transportation
Federal Highway Administration

Indiana Division

575 North Pennsylvania Street, Rm 254
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(317) 226-7475
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October 10, 2014

In Reply Refer To:
HDA-IN

Mr. Scott Pruitt
Supervisor
U.S. Fish & Wildlife Service
Bloomington Field Office
620 South Walker Street
Bloomington, Indiana 47403-2121

Dear Mr. Pruitt:

The Federal Highway Administration (FHWA), in cooperation with the Indiana Department of Transportation (INDOT), is writing to you as part of our agencies' coordination on the proposal from U.S. Fish and Wildlife Service (USFWS) to list the northern long-eared bat (*Myotis septentrionalis)*, which appeared in the Federal Register on October 2, 2013.

The purpose of this letter is to submit a Tier 1 Biological Assessment (Addendum) for the Northern Long-Eared Bat and summarize what FHWA and INDOT have learned in the past 10 years of studying the northern long-eared bat and other bats in the Study Area. This Study Area included a 3 mile wide by 142 mile long corridor (Summer Action Area) and hibernacula within 5 miles of Preferred Alternate buffered by a circle with a radius of 5 miles (Winter Action Area). The detail of data uncovered on the Indiana bat and northern long-eared bat is extraordinary, which we offer for your consideration. We also believe that such information can be used for other projects in Indiana.

During these 11 years (2004-2014), 927 sampling events were completed, which identified 18,974 bats. Unprecedented efforts have been made to learn not only about the Indiana bat, but also other bat species including the northern long-eared bat. Distribution of sampling sites (as approved by USFWS) provided excellent coverage. We have studied bats during the summer by mist netting; fall/winter/spring in cave surveys; and for all months of the year for 6 years at the . Exhibit 1 summarizes the effort, sampling, and seasonality of data, as detailed in this Conference Report.

Sampling Type	# of Sample Events	Number of Bats		
		Indiana Bat	N. Long-eared Bat	Total # of Bats
Bridges	378	890*	4**	9,140
Mist Netting	392	112	339	4,119
Cave Surveys				
Harp Trapping	84	21	1,010	2,598
Census-In Cave	73	32	15	3,117
	927	1,055	1,368	18,974

* All Indiana bats were observed roosting under the .
** Two were under the and 2 under the .

From such surveys, USFWS (Bloomington Field Office – BFO) identified 38 northern long-eared bat maternity colonies that overlap to a very significant degree with Indiana bat maternity colonies. The geographic location of these Indiana bat colonies was utilized to locate excellent mitigation sites, as approved by USFWS (Exhibit 2 and Exhibit 3).

Fifty mitigation sites have been purchased in Sections 1-4 and currently, we have 25 mitigation sites in Section 5 that are in the process of right-of-way acquisition. These mitigation sites include conservation easements on caves and their adjoining and extensive foraging areas. These four caves are known hibernacula for the Indiana bat. The first three caves are also hibernacula for the northern long-eared bat. We do not have data on the northern long-eared bat for , but suspect northern long-eared bats use too. Such mitigation provides much needed protection to as many as 32,000 Indiana bats or 7.5% of their range wide population or 14.3% of their Indiana population, as well as many northern long-eared bats.

In reviewing the overlap of the Indiana bat and the northern long-eared bat in the I-69 Study Area, it was found that when an Indiana bat was identified, 87% of the time a northern long-eared bat was identified at the same location. At sites where northern long-eared bats were netted, 39% of the time an Indiana bat was captured. The difference in these percentages is due to there being 3 times more northern long-eared bats mist netted as well as the more general distribution of northern long-eared bats. Thus, the two species are very often found together. Results indicated that 65% of northern long-eared bat capture sites were located within Indiana bat maternity colonies, and the percent went up to 68% for capture sites for reproductively active female and juvenile northern long-eared bats in Indiana bat maternity colonies.

Maternity colony locations for the Indiana bat coincide to a great degree with northern long-eared bat maternity colonies. Other capture sites for the northern long-eared bat are near to Indiana bat maternity colonies. An area of concentration for identifying the northern long-eared bat in summer was the West Fork White River maternity colony and also its associated mitigation site of 355 acres. In 2005 spring harp trapping at , 189 northern long-eared bats were captured, while 2004 fall harp trapping at this cave showed 88 northern long-eared bats. A 2005 winter census showed 1 northern long-eared bat in . The northern long-eared bat ranked first of all bats captured in harp trapping (totaling 1,010 in 2004-2006).

Mitigation for the Indiana bat was targeted specifically within or near the established colony limits, and such colonies have a high overlap with where the northern long-eared bat colonies have been identified. Since they are similar species, we conclude that the mitigation to date not only benefits the Indiana bat, but also benefits the northern long-eared bat. About 77% of the mitigation sites are within ½ mile of northern long-eared bat maternity colonies. The majority of the remaining biologically attractive properties for mitigation were purchased as winter habitat, which can serve both species.

At the recommendation of USFWS in the 9 April 2014 meeting in Bloomington, FHWA and INDOT hereby initiate a formal Section 7 conference on the northern long-eared bat (a proposed endangered listed species) for impacts associated with the proposed I-69 Indianapolis to Evansville project. Our decision to initiate was prompted by USFWS proposing to list the northern long-eared bat as a federally listed species. In addition, USFWS recommended providing a Tier 1 Biological Assessment (Addendum) for the northern long-eared bat so that

USFWS can enter into conference with FHWA and INDOT and return a Conference Opinion. Information in this Tier 1 Biological Assessment (Addendum) for the northern long-eared bat will help USFWS in developing its Conference Opinion. We do not consider this initiation a re-initiation of consultation on the Indiana bat, so previous findings by USFWS remain unchanged and valid.

The enclosed Tier 1 BA (Addendum) for the Northern Long-Eared Bat, I-69 Evansville to Indianapolis, has been prepared for the entire length of the I-69 project. It provides information that has been gathered for the northern long-eared bat during the years of 2004 – 2014. This document is not intended to replace the original I-69 Evansville to Indianapolis Tier 1 BA (dated July 18, 2003) or the Tier 1 BA (Addendum) dated March 7, 2006; rather it is provided as a separate addendum providing the results of habitat surveys and analysis that have been conducted specific to the northern long-eared bat.

Based on this Tier 1 BA (Addendum) for the northern long-eared bat, we are requesting the initiation of a formal Section 7 conference regarding the project's impacts on the northern long-eared bat (*Myotis septentrionalis*). We also are requesting that you confirm in writing your previous concurrence with the determinations that the project is not likely to adversely affect the eastern fanshell mussel (*Cyprogenia stegaria*); and the project is likely to adversely affect, but not jeopardize, the Indiana bat (*Myotis sodalis*). We also are requesting that you confirm in writing that information in the Tier 2 BO's remain valid concerning these species.

With this letter, the FHWA is submitting a Tier 1 Biological Assessment (Addendum) for the Northern Long-Eared Bat and is exercising our option in accordance with 50 CFR 402.12(j) to initiate a formal conference at this time, concurrently with the submission of this BA. Please notify us, in accordance with the regulations, within 30 days as to your concurrence with the enclosed Tier 1 Biological Assessment (Addendum) for the northern long-eared bat.

Formal conferencing begins with the submittal of this BA and a Conference Opinion (CO) is requested on or before November 24, 2014. It is our understanding that the CO will include, at a minimum, a Statement on Jeopardy, Incidental Take Statement, and a Roadkill Analysis.

It is the understanding of FHWA that upon listing of the Northern Long-Eared Bat, FHWA would request confirmation of the CO from the USFWS in writing and the USFWS would have 45 days to respond. If no significant changes have occurred in the proposed action, or the information used in the conference, the USFWS would adopt the CO as the Biological Opinion and Section 7 Consultation would be considered complete.

We greatly appreciate the time that you and your staff have provided during the early coordination of this Section 7 Conference. We hope that this information will help in minimizing these time frames provided by the regulations for you to submit to us the BO. If you require any assistance during review, please do not hesitate to contact our office, INDOT or our consultant. Our consultant, Lochmueller Group, prepared the original Tier 1 BA (2003), Tier 1 BA Addendum (2006) and this Tier 1 BA Addendum (2014) for the Northern Long-Eared Bat and may function as our designated representative for this consultation. We understand that the ultimate responsibility for compliance with Section 7 remains with the FHWA.

We are requesting that portions of this document which are marked "Confidential" be kept confidential to the maximum extent possible, consistent with the requirements of the Freedom of

Information Act. Part of this information was obtained by the Indiana Department of Transportation (INDOT) and its consultants by promising knowledgeable members of the Indiana caving community that the information they disclosed to INDOT would be protected to avoid destruction of these resources.

As with all preliminary or potentially sensitive information related to this project that is being provided to your agency in the spirit of cooperation and early consultation, we request that your agency inform and consult with us in the event that there is a request that the information be released so that we can provide you any additional information you may need to assist in making the decision to grant such a request.

Please send your response to the undersigned with a copy to Michelle Allen at FHWA at (317) 226-7344 or Laura Hilden at INDOT at (317) 232-5018. We thank you for your time and consideration.

Sincerely,

Karen A Bobo

Richard J. Marquis
Division Administrator

cc: Ms. Michelle Allen, FHWA
Ms. Sandra Flum, INDOT
Ms. Laura Hilden, INDOT
Mr. Nathan Saxe, INDOT
Mr. Ken McMullen, INDOT
Mr. Steve Sperry, INDOT
Dr. Tom Cervone, Lochmueller Group
Mr. Jason DuPont, Lochmueller Group
Mr. Rusty Yeager, Lochmueller Group

Attachment: Tier 1 Biological Assessment (Addendum) for the Northern Long-Eared Bat

Abstract

This Tier 1 BA Addendum for the northern long-eared bat (*Myotis septentrionalis*) for the Interstate 69 (Evansville to Indianapolis) project is being prepared to initiate the conferencing process on this species as part of Section 7 formal consultation with the United States Fish and Wildlife Service (USFWS). The northern long-eared bat is expected to be listed as a federally endangered species. This document includes the results of northern long-eared surveys, as well as the results of impact analysis for maternity colony foraging areas, the Summer Action Area (SAA), and hibernacula foraging areas within the Winter Action Area (WAA). Changes to the proposed action since the completion of the Tier 1 BA Addendum in March 7, 2006 are also discussed in this Tier 1 BA Addendum for the northern long-eared bat.

Northern long-eared bat surveys completed as part of the I-69 project include mist netting during the summers of 2004, 2005, and 2008 to 2013 (8 years); harp trapping during the autumns of 2004 and 2005; cave surveys during the winters of 2004/2005 and 2005/2006; and harp trapping during the spring of 2005.

Three hundred and thirty seven (337) northern long-eared bats were captured from 101 of 189 surveyed mist net sites within the SAA in the summer in 2004, 2005 and 2008 to 2013. Radio-telemetry was not conducted since this species was not federally listed at the time of captures. Winter surveys from 2004-2006 showed 15 northern long-eared bats observed in eight caves, while harp trapping showed 1,015 northern long-eared bats from 49 caves.

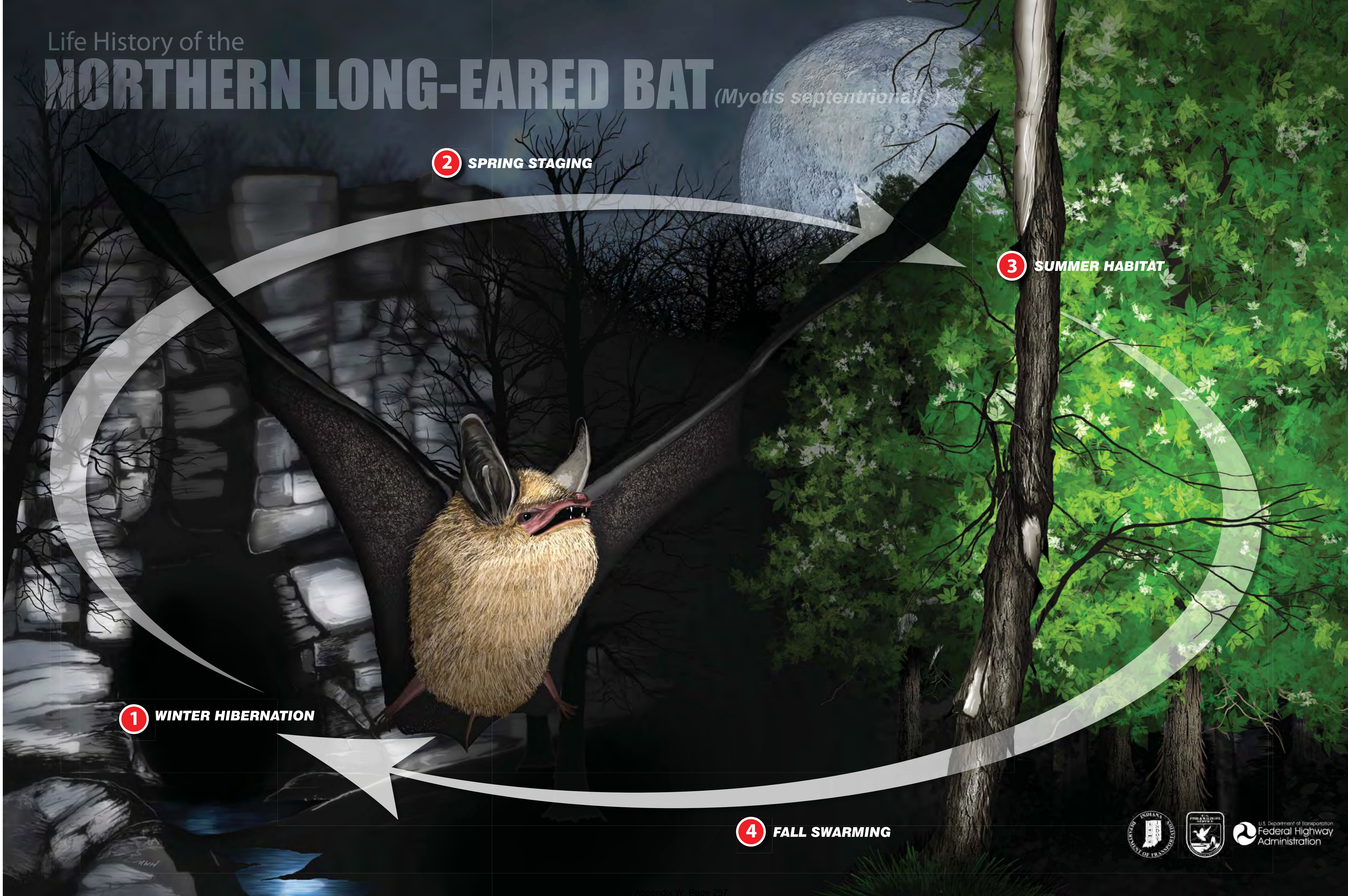
As a result of the SAA surveys, 38 maternity colonies were identified by USFWS Bloomington Field Office (BFO) along the I-69 corridor. This includes two colonies in Section 1, six colonies in Section 2, eight colonies in Section 3, nine colonies in Section 4, nine colonies in Section 5, and four colonies in Section 6. Each maternity colony foraging area was delineated by a circle with a radius of 1.5 miles.

Fifty-five (55) northern long-eared bat hibernacula foraging areas were determined within the WAA. A northern long-eared bat hibernaculum is any cave where northern long-eared bats were found hibernating or were harp-trapped at a cave entrance. Each hibernaculum foraging

area is delineated by a circle with a radius of 5 miles centered on the cave entrance. showed the greatest number of northern long-eared bats at 278.

Direct, indirect, and cumulative analyses were completed for each maternity colony foraging area and northern long-eared bat hibernaculum foraging area. The analysis focused on impacts to forest and was based on data developed specifically for this project. Direct impact analysis was not completed for Sections 1-4 since the interstate has been constructed in Sections 1-3 and tree clearing has been completed in Section 4. Direct impact analysis was completed for Sections 5 and 6.

A summary of the life history of the northern long-eared bat is included in this abstract. This life history summary was developed in consultation with the USFWS (BFO).


Life History of the
NORTHERN LONG-EARED BAT (Myotis septentrionalis)
2 SPRING STAGING
3 SUMMER HABITAT
1 WINTER HIBERNATION
4 FALL SWARMING
U.S. Department of Transportation
Federal Highway Administration

Life History of the

NORTHERN LONG-EARED BAT *(Myotis septentrionalis)*

COMMON NAME

The northern long-eared bat (Myotis septentrionalis) was first described as a distinct species by van Zyll de Jong in 1979 based on geographic separation and difference in morphology. Before that time, the northern long-eared bat was considered a subspecies of Keen's long-eared Myotis (Myotis keenii). No subspecies have been described for Myotis septentrionalis. This species has been recognized by different common names, such as Keen's bat, northern myotis bat, and northern bat. For the purposes of this documentation, we refer to this species as the northern long-eared bat.

1 WINTER HIBERNATION

(October to Mid-March)

Caves and mines are used by the northern long eared bat in winter. Hibernacula used are typically large, with large passages and entrances, relatively constant and cooler temperatures, and with high humidity and no air currents. The sites favored by them are often in very high humidity areas to such a large degree that droplets of water are often observed on their fur. They are typically found roosting in small crevices or cracks in cave or mine walls and can often be overlooked in surveys. To a lesser extent, they have been found overwintering in habitats that resemble caves or mines, such as abandoned railroad tunnels, storm sewer (Goehring 1954, p. 435), hydro electric dam (Kurta and Teramino 1994, pp. 410 411), aqueduct (French 2012, unpublished data) or other "unsuspected retreats" where caves and mines are not present. Northern long eared bats have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum. Other species in Indiana that commonly occupy the same hibernacula with the northern long eared bat are the little brown bat, big brown bat, tri colored bat, and Indiana bat. Northern long eared bats often move between hibernacula throughout the winter, which may further decrease population estimates. Similarly, this species has been found to fly in and out of some of the mines and caves in southern Indiana throughout the winter (Whitaker and Mumford 2009, p. 210).

2 SPRING STAGING

(Mid-March to Mid-May)

Both males and females emerge from caves and mines in spring. Northern long eared bats exhibit significant weight loss during hibernation. One Indiana study showed a 41 43 % loss (Whitaker and Hamilton 1998, p. 101). During staging, northern long eared bats are flying in and out of caves to feed and congregate around these caves before migrating to their summer homes. The northern long eared bat is not considered a long distance migratory species. Short migratory movements between summer roost and winter hibernacula are typically between 35 to 55 miles (Nagorsen and Brigham 1993, p. 88; Griffin 1945, p. 53). However, movements may range from 5 to 168 miles (Griffin 1945, p. 22). When females leave the cave, they are pregnant and on a mission to start a new generation in their summer home. Gestation is approximately 60 days (van Zyll de Jong 1995). Males are reproductively inactive until late July, with testes descending in most males during August and September (Caire et al. 1979, p. 407; Amelon and Burhans 2006, p. 69).

3 SUMMER HABITAT

(Mid-May to Mid-August)

During the summer, northern long eared bats typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and non reproductive females' summer roost sites may also include cooler locations, including caves and mines (Barbour and Davis 1969, p.77). They also have been found roosting in man made structures, such as buildings, barns, a park pavilion, sheds, cabins, under eaves of buildings, behind window shutters, and in bat houses (Mumford and Cope 1964, p. 72; Barbour and Davis 1969, p. 77; Cope and Humphrey 1972, p. 9; Amelon and Burhans 2006, p. 72; Whitaker and Mumford 2009, p. 209; Timpone et al. 2010, p. 119; Joe Kath 2013, pers. comm.). This species appears to be somewhat opportunistic in roost selection. Canopy cover at northern long eared bat roosts has ranged from 56% (Timpone et al. 2010, p. 118) to greater than 84% (Lacki and Schwierjohann 2001, p. 487). Females tend to roost in more open areas than males, likely due to the increased solar radiation, which aids in pup development (Perry and Thill 2007, p. 224). Roosts are also largely selected below the canopy, which could be due to the species' ability to exploit roosts in cluttered environments; their gleaning behavior suggests an ability to easily maneuver around obstacles (Foster and Kurta 1999, p. 669; Menzel et al. 2002, p. 112). One study found that northern long eared bats roost more often on upper and middle slopes than lower slopes, which suggests a preference for higher elevations due to increased solar heating (Lacki and Schwierjohann 2001, p. 486). Northern long eared bats switch roosts often (Sasse and Perkins 1996, p. 95), typically every 2 3 days (Foster and Kurta 1999, p. 665; Owen et al. 2002, p.2; Carter and Feldhamer 2005, p. 261; Timpone et al. 210, p. 119). Reasons for switching may be temperature, precipitation, predation, parasitism, and ephemeral roost sites (Carter and Feldhamer 2005, p. 264). The northern long eared bat is comparable to the Indiana bat in terms of summer roost selection, but appear to be more opportunistic (Carter and Feldhamer 2005, pp. 265 266; Timpone et al. 2010, pp. 120 121). Although northern long eared bats are more opportunistic than Indiana bats, there may be a small amount of roost selection overlap between these two species (Foster and Kurta 1999, p. 670; Timpone et al. 2010, pp. 120 121). Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009, p. 212) to 60 individuals (Caceres and Barclay 2000, p. 3). Adult females give birth to a single pup. Birth likely occurs in late May or early June (Caire et al 1979, p. 406; Easteria 1968, p. 770; Whitaker and Mumford 2009, p. 213), but may occur as late as July (Whitaker and Mumford 2009, p.213). Juvenile volancy (flight) occurs by 21 days after birth (Krochmal and Sparks 2007, p. 651; Kunz 1971, p. 480). Adult longevity is estimated to be up to 18.5 years (Hall et al. 1957, p. 407) with the greatest recorded age of 19 years (Kurta 1995, p.71).

4 FALL SWARMING

(Mid-August to November)

With the onset of fall and cooler temperatures, males return to the caves. They are at the entrances when females and young arrive. Elevated hormone levels trigger males to mate with females. Hibernating females store sperm until spring, exhibiting delayed fertilization (amphigonia retardata). Swarming is a milling of the bats around and out of the cave entrance. This behavior may have several functions, but one seems to bring the sexes together for mating. Members of both sexes feed and gain weight through the fall, thus putting on fat (energy) to help them survive through hibernation. It is not known if juvenile females mate their first autumn. Limited mating may occur in the cave in winter and may even occur in the spring. When temperatures are 50 degrees F or less, the bats start to stay inside the cave.

The majority of this information came from 50 CFR Part 17, Volume 78, No. 191. To all the scientists that contributed to its development, we extend our appreciation and gratitude.
For additional information, please refer to the United States Fish and Wildlife Service's Region 3 website (http://www.fws.gov/midwest/endangered/mammals/index.html) and the Northern Long-Eared Bat Interim Conference and Planning Guidance, USFWS Regions 2, 3, 4, 5 & 6, January 6, 2014.

Acknowledgements: The design and artwork for this product were developed by Lochmueller Group, Inc. in Evansville, Indiana in cooperation with the U.S. Fish and Wildlife Service – Bloomington Field Office.

STATUS

On October 2, 2013 in 50 CFR Part 17, Volume 78 and No. 191, the U.S. Fish and Wildlife Service (USFWS) proposed the northern long-eared bat (Myotis septentrionalis) for listing as endangered under the Endangered Species Act (ESA) throughout its range. The USFWS also determined that critical habitat for the northern long-eared bat is not determinable at this time. This proposed rule, if finalized, would extend the Act's protections to the northern long-eared bat. It is anticipated that USFWS will make a decision on the northern long-eared bat listing by April 2, 2015.

SUMMARY OF FACTORS AFFECTING SPECIES

Under Section 4(a)(1) of Act (16 U.S.C. 1533) and its implementing regulations at 50 CFR part 424, USFWS has the authority to list a species based on any of the following 5 factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. They found that no other threat is as severe and immediate to the northern long-eared bat's persistence as the disease, white-nose syndrome (WNS). Therefore, WNS is currently the predominant threat to this species.

FEEDING

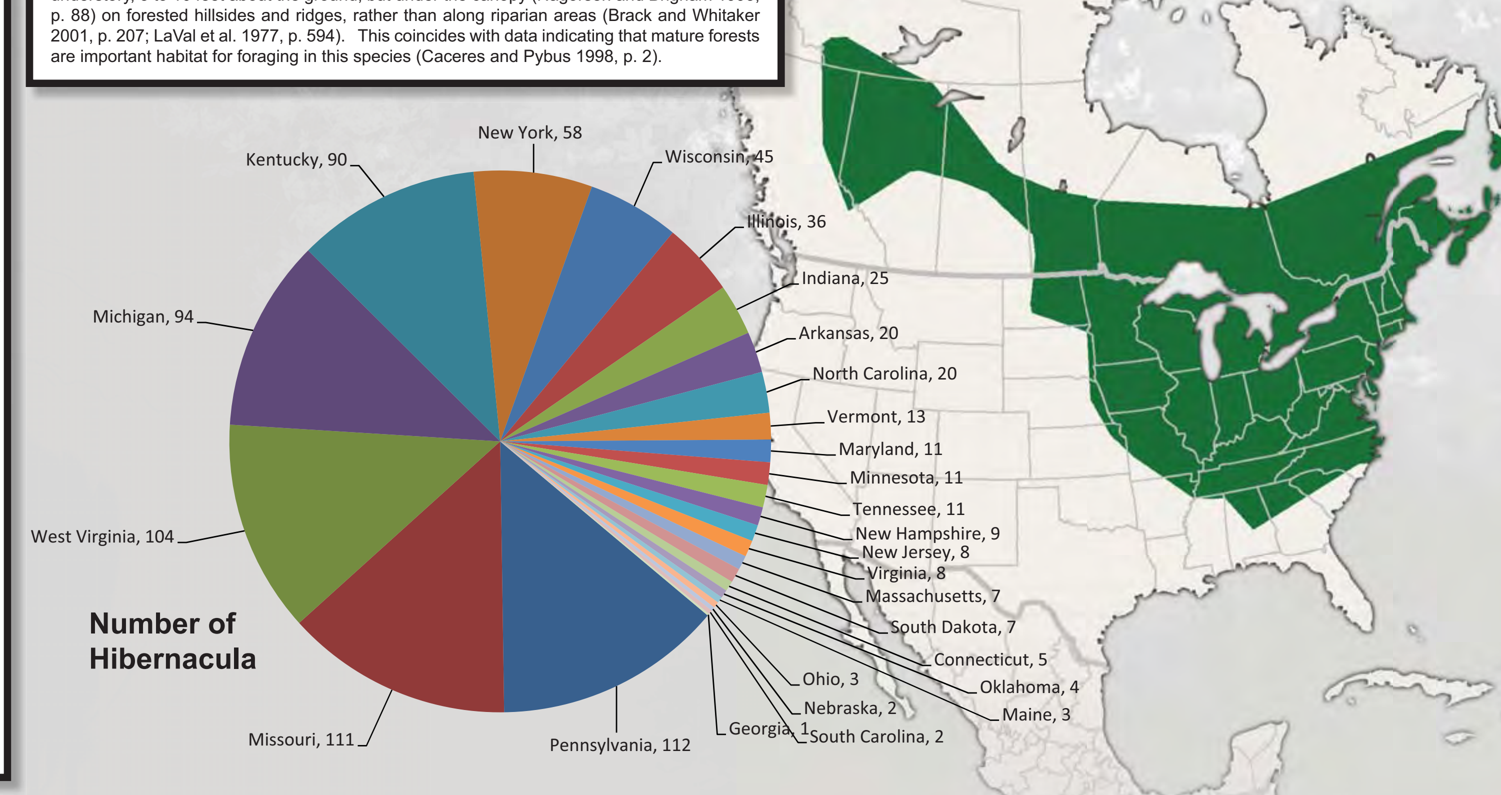
The northern long-eared bat has a diverse diet including moths, flies, leafhoppers, caddisflies, spiders and beetles with diet composition differing geographically and seasonally (Brack and Whitaker 2001, p. 208). The most common insects found in the diets of northern long-eared bats are moths and beetles (Feldhamer et al. 2009, p. 45; Brack and Whitaker 2001, p. 207) with spiders also being a common prey item (Feldhamer et al. 2009, p. 45). Foraging techniques include hawking (catching insects in flight) and gleaning (picking insects off stationary features such as leaves or branches) in conjunction with passive acoustic cues (Nagorsen and Brigham 1993, p. 88; Ratcliffe and Dawson 2003, p. 851). Presence in their feces are spiders, other non-flying insects, and green plant material suggest considerable gleaning behavior. The northern long-eared bat has a very high frequency call. Gleaning allows this species to gain a foraging advantage for preying upon moths because moths are less able to detect high frequency echolocation calls (Faure et al. 1993, p. 185). Emerging at dusk, most hunting occurs above the understory, 3 to 10 feet about the ground, but under the canopy (Nagorsen and Brigham 1993, p. 88) on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001, p. 207; LaVal et al. 1977, p. 594). This coincides with data indicating that mature forests are important habitat for foraging in this species (Caceres and Pybus 1998, p. 2).

SPECIES DESCRIPTION

The northern long-eared is a medium-sized bat as distinguished by its long ears which average 17 mm. When laid forward, they extend beyond the nose but less than 5 mm beyond the muzzle (Caceres and Barclay 2000, p. 1). The tragus is long, pointed and symmetrical. Its length is greater than half the ear. Body color is darker brown on back, and a lighter brown on ventral side. It is most often confused with little brown bat; however, it does not have the sheen to fur, and has longer ears and tragus.

Myotis septentrionalis
Weights and Measurements

Total Length	77mm - 92mm
Forearm Length	34mm - 39mm
Tail	26mm - 42mm
Hind Foot	5mm - 11mm
Ear	14mm - 19mm
Tragus	9mm - 11mm
Weight	5g - 9g



Number of Hibernacula

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Preface

This chapter includes the following topics:

Introduction

This Tier 1 Biological Assessment (BA) Addendum for the northern long-eared bat (*Myotis septentrionalis*) for I-69 Evansville to Indianapolis project initiates consultation, and appends information for the northern long-eared bat to the earlier Tier 1 BA for Threatened & Endangered Species (July 18, 2003 as revised October 27, 2003), Tier 1 BA Addendum (March 7, 2006), Tier 2 BA of I-69 Section 5 (December 19, 2012), and other Tier 2 BAs in Sections 1, 2, 3 and 4, as appropriate.

The scope of work includes completing a Tier 1 BA Addendum for the northern long-eared bat that is proposed for federal listing. In a meeting on 9 April 2014, the United States Fish and Wildlife Service (USFWS), Federal Highway Administration (FHWA) and Indiana Department of Transportation (INDOT) agreed a Tier 1 BA Addendum was needed for the northern long-eared bat to initiate conferencing on this species. As part of the Section 7 Conferencing process, INDOT/FHWA will prepare a BA as if the species were listed which provides a determination of effect (i.e., “likely to adversely affect”).

Submittal of the BA and requesting conference opinion will initiate the conferencing process with the USFWS on the northern long-eared bat. USFWS will prepare a Conference Opinion (CO) that would only make a determination of jeopardy/non-jeopardy since the species is not currently listed. However, because it is the desire of FHWA/INDOT to have a seamless transition between the pre-listing Conferencing Opinion and the post-listing BO, FHWA/INDOT is requesting a “take statement” for the northern long-eared bat in an initiation letter. USFWS will in turn draft an incidental take statement which would become a part of the BO once the species is listed.

A Tier 1 CO will be prepared by the USFWS from the BA prepared by INDOT/FHWA and will be included as an amendment to the Tier 1 BO which can then be referenced in the amended Tier 2 Section 5 BO. Amendments to the Tier 1 and Tier 2 (Section 5) BOs will be concurrent. The Tier 2 amendment is believed to be needed since all of the trees in Section 5 have not yet been cleared. Tree clearing for the project has been completed within the majority of the northern long-eared bat WAA. The only area yet to be cleared of trees in the northern long-eared bat WAA is a small stretch of 1-2 miles north of Beanblossom Creek in Section 5 and small minor areas to the south of Beanblossom Creek.

This document provides additional information that has been gathered for the northern long-eared bat since the publication and submission of the original I-69 Evansville to Indianapolis Tier 1 BA dated July 18, 2003 (Revised October 27, 2003) and Tier 1 BA Addendum (March 7, 2006). The original I-69 Tier 1 BA documented the anticipated effects of building, operating, and maintaining the proposed I-69 (Alternative 3C) from Evansville to Indianapolis on individuals and populations of the federally endangered Indiana bat and fanshell mussel (*Cyprogenia stegaria*); and the federally threatened bald eagle (*Haliaeetus leucocephalus*)[1]. The Tier 1 BA Addendum dated March 7, 2006 discussed additional information gathered on the Indiana bat. Because there is no new information available on the fanshell mussel or bald eagle in relation to the I-69 project since the original Tier 1 BA, the previous consultation on these species is still valid and is therefore not a subject of this addendum.

This document is not intended to replace the original Tier 1 BA in 2003, the Tier 1 BA Addendum in 2006, or the Tier 2 BAs for Sections 1-5, but rather it supplements them with the results of habitat surveys and analysis that have been conducted since the publication of these documents with information for the northern long-eared bat. It includes new information regarding the presence of the northern long-eared bat within the Action Area as well as the possible refinement of habitat (forest and wetland) impacts resulting from the development of Tier 2 alignment footprints. It also documents any changes to the proposed action that have

[1] The bald eagle was delisted from the federal threatened status by final rule on July 9, 2007. The species continues to be protected under the Bald and Golden Eagle Protection Act (16 U.S.C. §§668-668d) and the Migratory Bird Treaty Act (16 U.S.C. §§703-712)

occurred since the completion of these documents. Proposed action changes that have taken place since the Tier 1 BA, Tier 1 BA 2006 Addendum and Tier 2 BAs were completed, did not result in any additional anticipated impacts to the Indiana bat, therefore additional consultation for this species is not required, and thus not included in this addendum. This document appends to the Tier 1 BA in 2003, Tier 1 BA Addendum in 2006 and Tier 2 BAs for Sections 1-5. It does not take the place of a Tier 2 BA for Section 6 that will need to be completed in the future.

It is FHWA and INDOT's opinion that although the acreage impacts have changed, partially due to the change in methodology and partially because of the location of the design right-of-way, the overall impacts to the northern long-eared bat are similar to the Indiana bat and as such, the FHWA is making the determination of "**MAY AFFECT – IS LIKELY TO ADVERSELY AFFECT**" for individual northern long-eared bats that use habitat within/near the construction corridor. This document presents indirect and cumulative impacts for Sections 1-4; and direct, indirect and cumulative impacts for Sections 5 and 6 within the SAA; indirect and cumulative impacts for Section 4 and 5 in the WAA; and direct impacts for Section 5 where tree clearing has not already been completed.

Proposed Action

The Federal Highway Administration (FHWA) and the Indiana Department of Transportation (INDOT) are proposing construction of I-69 from Evansville to Indianapolis, Indiana. It is a comprehensive National Environmental Policy Act (NEPA) study that was and will be carried forward in two tiers. Tier 1 of the study involved extensive environmental, transportation, and economic studies, and cost analysis. The Tier 1 Environmental Impact Statement (EIS) provided a basis for the FHWA to grant approval for a specific *corridor*. In most cases, the *corridor* is approximately 2,000 feet wide, but has been narrowed or widened in some instances to avoid or provide flexibility to avoid environmentally sensitive areas. A working alignment within the *corridor*, ranging from approximately 270 – 470 feet wide, was developed to estimate potential impacts for the Tier 1 study. The Tier 1 study was completed on March 24, 2004 with the issuance of the Tier 1 Record of Decision (ROD) signed by FHWA. Alternative 3C was the Selected Alternative for this project. Alternative 3C is near SR 57 from Evansville to Washington, crossing the Patoka River National Wildlife Refuge acquisition boundary. The alternative continues to the east of Washington north to Elnora, then turns east overland toward

Bloomington. From Bloomington north, the alternative is located on existing SR 37 to connect to I-465 at Indianapolis.

The proposed action is construction, operation, and maintenance of an Interstate highway, approximately 142 miles long, connecting Evansville and Indianapolis, Indiana. Approximately 35% of the proposed route would be mostly within the footprint of an existing 4-lane highway, SR 37; however, the remaining 65% or approximately 90 miles of interstate would be constructed on entirely new right-of-way. The proposed action would also involve constructing multiple interchanges (the actual number may change in Tier 2), as well as new local access roads, and improvements to existing roads. The project is part of a larger, national proposal to connect the three North American trading partners of Canada, the United States, and Mexico by an Interstate highway in the states of Michigan, Indiana, Kentucky, Tennessee, Mississippi, Arkansas, Louisiana, and Texas. The purpose of the I-69 Evansville to Indianapolis Project is to provide an improved transportation link between Evansville and Indianapolis that: 1) strengthens the transportation network in southwestern Indiana, 2) supports economic development in southwestern Indiana, and 3) completes the portion of the National I-69 project between Evansville and Indianapolis.

Tier 2 NEPA studies have been completed or are currently being conducted to determine a specific alignment within the selected corridor. The corridor selected in Tier 1 has been divided into six (6) sections. To provide more flexibility, Tier 2 NEPA studies will be conducted on each project section rather than singly on the entire route. The six (6) project sections to be carried forward to Tier 2 are (traveling northeast) (Figure 1):

1. From I-64 (near Evansville) via the SR 57 corridor to SR 64 (near Princeton/Oakland City)
2. From SR 64 (near Princeton/Oakland City) via the SR 57 corridor to US 50 (near Washington)
3. From US 50 (near Washington) via the SR 57 corridor and cross country to US 231 (near Crane Naval Surface Warfare Center (NSWC))
4. From US 231 (near Crane NSWC) cross country to SR 37 (south of Bloomington)
5. From SR 37 (south of Bloomington) via SR 37 to south of SR 39 (Martinsville)
6. From south of SR 39 (Martinsville) via SR 37 to I-465 (Indianapolis)

At this time, Tier 2 NEPA and BAs (with BOs from USFWS) are completed for Sections 1-5, and construction of the roadway has been completed for Sections 1-3 or the first 67 miles. Clearing of trees is completed for Section 4 and the lower third of Section 5. Construction of the highway in Section 4 is expected to be completed in 2015.

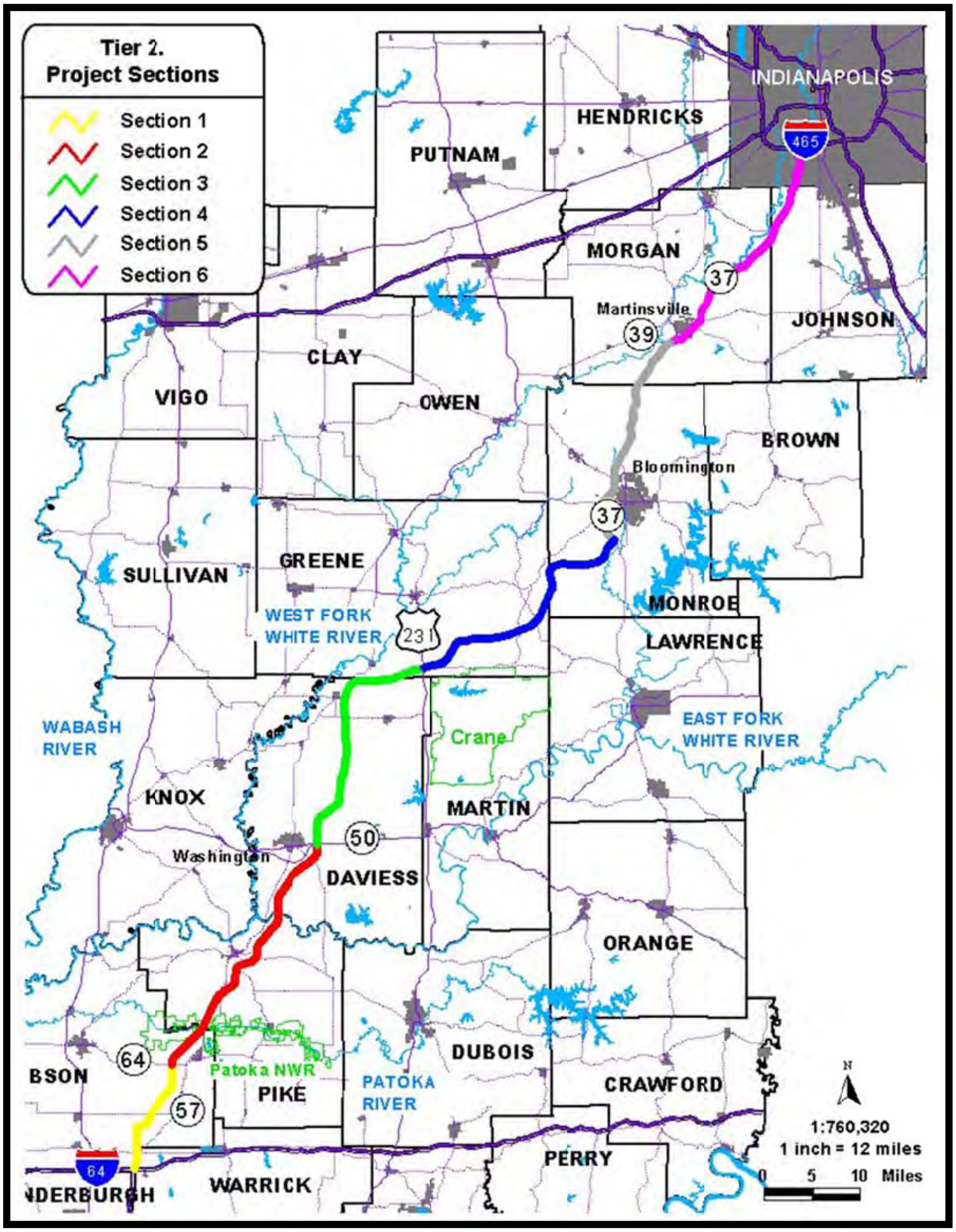

Figure 1: I-69 Evansville to Indianapolis Tier 2 Project Sections

Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan

During Tier 1, INDOT and FHWA developed a Tier 1 Forest and Wetland Mitigation and Enhancement Plan ("Plan") for the proposed project in consultation with the USFWS and other review agencies. This Plan to find biologically attractive mitigation sites will continue to be used for the northern long-eared bat, as appropriate.

The Tier 1 Forest and Wetlands Mitigation and Enhancement Plan included a commitment to replace wetlands at a ratio of 3:1 for forested and scrub/shrub wetlands, and a ratio of 2:1 for emergent wetlands. In addition to wetland mitigation, the Plan included a commitment to mitigate for upland forests at a ratio of 3:1.

The Plan noted that if impacts were reduced below the levels estimated in Tier 1, then the level of mitigation acreage required under the Plan would be reduced accordingly; similarly, if the impacts were higher than estimated in Tier 1, then the mitigation acreage would increase. The Plan also noted that further enhancements to the mitigation measures listed in the Plan would be determined in consultation with the USFWS and other regulatory agencies on a case-by-case basis in Tier 2. The Plan also noted that the mitigation sites identified in the Plan were conceptual, and that specific mitigation sites would be determined during and after Tier 2 and noted that INDOT would acquire mitigation sites only from willing sellers at fair market value.

Consideration in Biological Opinion

The USFWS's original BO for the project, issued on December 3, 2003, included a description of the Tier 1 Forest and Wetland Mitigation and Enhancement Plan. (Tier 1 BO, pp. 8-10.) The USFWS specifically considered the Plan as part of the analysis that supported its no-jeopardy finding for the project. (Tier 1 BO, pp. 74-75). In addition, the USFWS required implementation of the measures contained in the Plan, or equivalent measures deemed satisfactory by the USFWS, as one of the mandatory terms and conditions in the Incidental Take Statement for the Indiana bat. (Tier 1 BO, p. 79). Specifically, the Incidental Take Statement included the following mandatory condition:

> The FHWA must implement all proposed mitigation and conservation measures, as detailed in the "Tier 1 Forest and Wetland Mitigation and Enhancement Plan" and "Conservation Measures for Impacts to Threatened and Endangered Species" sections and Appendix B of the Tier 1 BA or alternative measures that

are of equal or greater benefit to Indiana bats as developed in consultation with the Service during Tier 2.

By way of this document, FHWA and INDOT also commits to implement all proposed mitigation and conservation measures, for the northern long-eared bat.

Updates to Tier 1 Mitigation and Enhancement Commitments

This conferencing process for the northern long-eared bat applies to the entire I-69 Evansville to Indianapolis project and allows an opportunity to review and, where appropriate, update the Tier 1 mitigation and enhancement commitments. Updates may be appropriate where new information has been developed about the project's impacts or about specific mitigation sites; modifications also may be appropriate in order to clarify statements in the original Plan. Any updates contained in this Tier 1 BA Addendum for the northern long-eared bat will supersede commitments in the original Plan, if accepted by the USFWS and incorporated into a new or revised CO by USFWS for the project.

Mitigation Commitments

As part of this document and as in previous addenda, FHWA and INDOT are re-affirming their commitment to the mitigation ratios (Table 1) provided in the Tier 1 Forest and Wetlands Mitigation and Enhancement Plan. They include:

Table 1. Tier 1 Mitigation Commitments

Resource Type	**Mitigation Ratio**
Forested Wetlands	3:1
Scrub/Shrub Wetlands	3:1
Emergent Wetlands	2:1
Upland/Bottomland Forest	3:1
Wetlands Buffer	Include additional land as buffer around wetlands mitigation sites

Principles for Selecting Mitigation Sites

Mitigation sites and easements have been and will only be purchased from willing sellers at fair market value. FHWA and INDOT propose the following principles to guide the selection of forest and wetlands mitigation sites for the project. They have used such criteria for the Indiana bat and they believe existing mitigation sites purchased for the Indiana bat are also beneficial for the northern long-eared bat.

a. Wherever possible, mitigation for impacts in the vicinity of a northern long-eared bat maternity colony will be provided within a 1.5-mile radius of the estimated location of the colony. The area within this 1.5-mile radius is referred in this document as the maternity colony foraging area. Maps in Appendix E and Exhibits 2 and 3 show the location of the 38 northern long-eared bat maternity colonies and mitigation priority areas. Where mitigation cannot be provided within the maternity colony foraging area, any additional mitigation for impacts to the colony will be provided elsewhere within the SAA, or, if such sites are not available, at other locations acceptable to the USFWS, FHWA, and INDOT. Mitigation will include both the protection of existing habitat (through acquisition of easements or other ownership interests in the property) and the creation of new habitat (through reforestation and wetlands restoration/creation).
b. Mitigation measures that include property acquisition (including acquisition of easements) will be carried out only with willing sellers at fair market value. When seeking to acquire sites for mitigation purposes, FHWA and INDOT will try to identify potential willing sellers and try to reach an agreement with them.
c. The USFWS will be consulted prior to acquisition of sites that are intended to be used as mitigation for impacts to the Indiana bat and northern long-eared bat.
d. On a project-wide basis, FHWA and INDOT will provide mitigation for upland forest impacts at a ratio of 3:1 as committed in the Tier 1 FEIS and ROD. Some of the land used to meet this 3:1 commitment may be located outside Action Areas as was done for the Indiana bat. Consultation with the USFWS will determine what will be deemed appropriate for northern long-eared bat mitigation. Mitigation goals are to replace direct forest impacts at a minimum of 1:1 ratio, while the 2:1 of the 3:1 ratio may be used for forest preservation.
e. Mitigation for impacts to northern long-eared bat maternity colonies will be determined on a case by case basis and will be located within Action Areas. The appropriate mitigation ratio for impacts to the northern long-eared bat will be determined as part of this documentation and Tier 2 Section 7 process, taking into account the type and location of the mitigation, as well as the nature of the impacts. The mitigation provided for the northern long-eared bat within the Action Area may be provided at a ratio of less

or greater than 3:1, if a lower or higher ratio is determined to be appropriate as part of the Tier 2 Section 7 process.

f. Mitigation for impacts to northern long-eared bats may also serve as mitigation for other environmental resources, such as wetlands.

Conservation Measures

It is the purpose of this Tier 1 BA Addendum for the northern long-eared bat to initiate conferencing and provide USFWS with all of the information on the northern long-eared bat learned since December 3, 2003, when the original Tier 1 BO was issued.

The following conservation measures were jointly developed by the FHWA, INDOT, and the USFWS during informal consultation as part of the Tier 1 study and were subsequently incorporated into the Tier 1 BA as part of the proposed action. These measures were specifically designed to avoid and minimize impacts of the proposed action on Indiana bats and to further their recovery, **and because of similarities between the species are hereby offered for the northern long-eared bat.** In the original Tier 1 BO (dated December 3, 2003), the USFWS analyzed the effects of the proposed action based on the assumption that all conservation measures would be implemented or equivalent measures developed in consultation with the USFWS during Tier 2. The beneficial effects of the following measures were taken into consideration for both jeopardy and incidental take analyses.

Since the development of the Tier 1 BA, FHWA and INDOT have generated additional information for the northern long-eared bat. Therefore, the following conservation measures are provided along with any suggested revisions in this Tier 1 BA Addendum. A status report is provided for reference.

It is important to note that those conservation measures developed for the bald eagle and eastern fanshell mussel in the original Tier 1 BA remain valid although they are not listed below.

Conservation measures below for the northern long-eared bat have been added to those of the Indiana bat measures reported in the Tier 1 BA Addendum dated March 7, 2006. Due to similarities in the two species, FHWA and INDOT consider conservation measures suitable for the Indiana bat to be similarly suitable for the northern long-eared bat.

A. <u>CONTEXT SENSITIVE SOLUTIONS</u>

1. *<u>WINTER HABITAT</u>*

a. **Alignment Planning** – Efforts will be made to locate Interstate alignments beyond 0.5 mile from known Indiana bat hibernacula.

Status – **Completed for Indiana bat**. All alternatives are 0.5 mile or more from an existing Indiana bat hibernacula. The road has been built in Sections 1-3.

The Preferred Alternative in Sections 4 and 5 show six northern long-eared bat hibernacula within 0.5 mile. Five of these caves are in Section 4 with in the lower portion of Section 5 along SR 37. Tree clearing in Sections 1-4 is completed. Tree clearing in Section 5 was completed for most utilities and southern portions of the right-of-way as of April 1, 2014. Tree clearing for the remainder of the right-of-way in Section 5 is proposed from October 15, 2014 to March 31, 2015.

Northern long-eared bat hibernacula within 0.5 miles of the roadway are

. Approximate distances of these caves from existing cleared right-of-way are:

Cave Name	Distance to Right-of-Way (miles)
	0.3
	0.4
	0.3
	0.1
	0.5
	0.3

The WAA for the northern long-eared bat is within Greene, Monroe, Lawrence and Owen counties. There are 60 known hibernacula for the northern long-eared bat in these four counties. Fifty-five hibernacula are within 5 miles of the Preferred Alternative and thus comprise the WAA. Hibernacula for this species include caves that showed northern long-eared bats hibernating in the cave and/or those that have had northern long-eared bats harp trapped at cave entrances.

Hibernacula for the northern long-eared bat are:

Numbers (in parentheses) come from I-69 data and indicate the number of northern long-eared bats harp trapped at their entrance and/or observed in a winter cave survey, while "winter cave survey" indicate their winter occurrence in caves (USFWS data). A total of 1,030 northern long-eared bats have been recorded from 50 caves reviewed in I-69 surveys. The northern long-eared bat was the most common species harp trapped in this project.

b. **Blasting** – All efforts will be made to avoid blasting between September 15 and April 15 in areas within 0.5 mile of known northern long-eared bat hibernacula. All blasting in the WAA will follow the specifications developed in consultation with the USFWS and will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of nearby caves serving as northern long-eared bat hibernacula. Due to existing construction contracts in place prior to consideration of the northern long-eared bat, this commitment will not be fully implemented prior to the listing of the species. All efforts will be made to blast in the fall of 2014 and avoid the 2014-15 winter time period for

Blasting is not anticipated for

Status – **Completed for Indiana Bat and Ongoing for the Northern Long-Eared Bat**.. All blasting (within all areas) will be done after consulting with USFWS, INDOT, and FHWA. Blasting within areas where dimension limestone is quarried will also be completed following special provisions developed in consultation with limestone industry representatives as well as the Indiana Geological Survey (IGS) and other geology experts.

Upon consulting with USFWS, the limestone industry representatives concurred that the design plans and INDOT Standard Specifications seem appropriate and that they did not have any further questions or comments regarding the specifications. USFWS requested additional coordination if the proposed monitoring reveals that ground movement, vibrations, or other stability measurements are exceeded. As part of the specifications, detailed monitoring requirements are required to ensure blasting techniques do not damage adjacent features. Special provisions were developed with the limestone companies.

c. **Hibernacula Surveys** – A plan for hibernacula surveys (caves and/or mines) will be developed and conducted in consultation with and approved by the USFWS during Tier 1 studies.

Status – **Completed**. The plan was completed with USFWS and fieldwork has been conducted. To date, 373 cave records were evaluated and 250 caves were visited in the field. Of these, 61 caves met the proper search criteria for habitat and were surveyed for bats in 2004 and 2005. Sixteen caves had fall harp trapping conducted in 2005. These 16 caves also had internal cave surveys completed in December 2005. The northern long-eared bat ranked 1st in number with 1,015 northern long-eared bats harp trapped at cave entrances. Eighteen caves showed northern long-eared bat occupation in the winter based on data from the USFWS and 2004-05 and 2005-06 winter surveys conducted for the I-69 project. These caves were

. The number of northern long-eared bats found in these hibernacula were very low. Specifically, there were 1,015 northern long-eared bats harp trapped and 15 northern long-eared bats observed in cave surveys. The caves that actually showed northern long-eared bats inside were

.

d. **Karst Hydrology** – To avoid and minimize the potential for flooding, dewatering, and/or microclimate (i.e., temperature and humidity) changes within hibernacula, site-specific efforts will be made to minimize changes in the amount, frequency, and rate of flow of roadway drainage that enters karst systems that are determined to be hydrologically connected to hibernacula.

Status – **Completed for Indiana bat and Ongoing for Northern Long-Eared Bat**. is the only known hibernaculum that is hydrologically connected with the corridor that had Indiana bats at one time, but not for many years.

For the northern long-eared bats, 2 caves have hydrological connections to the Preferred Alternative. They are . Clearing of trees has been completed in these areas of Section 4 and 5 respectively. is in close proximity to the roadway and there is potential for impacts. In addition, lies down gradient from the roadway, and has no known hydrological connection to I-69, but there is a potential for impact. These caves will be recognized by FHWA and INDOT as northern long-eared bat hibernacula and receive karst protective measures, as appropriate. Much effort has been taken to protect groundwater resources and caves systems in Section 4. FHWA and INDOT have been working with IDNR, IDEM, and USFWS in following the Karst MOU dated October 1993 in Section 4 and will continue such coordination and efforts to protect groundwater resources and cave systems in Section 5. Karst features in the project are solely in Sections 4 and 5.

2. *AUTUMN/SPRING HABITAT*

   a. **Tree Removal –** To minimize adverse effects on bat habitat, tree (three or more inches in diameter) cutting will be avoided within five miles of a known hibernaculum. If unavoidable, cutting will only occur between November 16 and March 31.

      Status – **To be completed for the northern long-eared bat**. Tree cutting within five miles of known hibernacula will only occur between November 15 and March 31.

3. *SUMMER HABITAT*

   a. **Alignment Planning** – Efforts will be made to locate Interstate alignments so they avoid transecting forested areas and fragmenting core forest where reasonable.

      Status – **To be completed**. This effort has been completed for Sections 1 through 5. This effort will continue throughout the final preferred alternative development for Section 6.

   b. **Tree Removal** – Tree and snag removal will be avoided or minimized as follows:

      1. **Tree Cutting** – To avoid any direct take of Indiana bats and northern long-eared bats, no trees with a diameter of 3 or more inches will be removed between April 15 and September 15. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. In the median, outside the clear zone, tree clearing will be kept to a minimum to keep woods in as natural state as reasonable. Forested medians will be managed following the IDNR State Forest Timber Management Plan.

Status – **To be completed**. All tree cutting activities will only occur within the construction limits. All tree clearing within the proposed construction limits will follow USFWS seasonal cutting restrictions. The construction limits will be identified during final design. Based on USFWS revised guidance dated February 14, 2008, the new tree clearing restriction dates of April 1 through September 30 for the SAA will be used for future sections to be developed. The majority of Section 4 and a portion of Section 5 are within the WAA and will follow the dates for autumn/spring habitat removal (as noted above). Clearing of trees in Section 4 and the lower third of Section 5 have been completed.

Note there have been six instances of accidental tree removal that have occurred to date during the time frames mentioned above. These incidences occurred in August and September of 2011, May and June of 2012, and July and November of 2013. In all instances, INDOT/FHWA had qualified biologists review conditions and coordinate with USFWS. It was agreed that there was not likely impacts to bats resulting from the accidental tree removals. The USFWS has been previously notified of all of these instances.

2. **Mist Netting** – In areas with suitable summer habitat for the northern long-eared bat, mist net surveys will be conducted between May 15 and August 15 at locations determined in consultation with the USFWS as part of Tier 2 studies. If northern long-eared bats are captured in Section 5, some will be fitted with radio transmitters and tracked to their diurnal roosts for at least 5 days unless otherwise determined by the USFWS.

   Status – **To Be Completed**. One hundred and forty-eight mist netting sites were completed in 2004 and 49 were completed in 2005. This information helped in avoiding sensitive areas that may have impacted this species. However, due to the length of time since the original surveys, USFWS has requested that Sections 5 and 6 be mist netted again. As such, mist netting was conducted for Section 5 in the summer of 2012. Mist netting of Section 6 will be scheduled in the future as directed by USFWS, FHWA, and INDOT.

c. **Bridges –** Bridges will include the following design features:

1. **Surveys** – The undersides of existing bridges that must be removed for construction of I-69 will be visually surveyed and/or netted to determine their use as night roosts by the northern long-eared bat during the summer.

   Status – **Completed**. Two hundred and fifty-nine (259) bridges and culverts within the SAA were inspected for northern long-eared bats. Of the 259 bridge surveys, northern long-eared bats were found underneath two bridges. They were the which showed 2 individuals, while the 2nd bridge was the It also showed 2 individuals.

   A large bridge that showed many bats and was studied for 6-8 years showed over 8,500 bats of 5 species. The northern long-eared bat was never found under this bridge even though they were a very common species in this geographic area. This bridge will not be removed as a result of the I-69 project. However, due to the presence of bats (especially the Indiana bat) near concentrations of human disturbance (e.g. graffiti), INDOT and FHWA have worked with USFWS on fencing both ends of this bridge in order to avoid human disturbance to bats. The fencing is identified as a conservation measure for the Tier 1 BA Addendum. Two fences, approximately 30 feet wide and six feet high with an angled top, were installed under the bridge in April 2006 by INDOT Vincennes District. In September 2007, signs were installed at the bridge indicating that coordination with INDOT Vincennes District and USFWS will be required for work performed on or within 200 feet of the bridge. Both fences have a gate and a key for USFWS to access. As of January 2009, the terms and conditions for this commitment were considered met and INDOT is not proposing any other monitoring of the bridge as part of I-69.

2. **Bat-friendly bridges** – Where feasible and appropriate, interstate and frontage road bridges will be designed to provide suitable night roosts for bats in consultation with the USFWS.

Status – Due to concerns about attracting bats to the high-speed interstate facility, it is not currently proposed to include any “bat friendly” bridges along I-69. USFWS concurs with no “bat friendly” bridges.

3. **Floodplains** – Where reasonable and appropriate, floodplains and oxbows will be bridged to protect environmentally sensitive areas. The Patoka River floodplain will be bridged in its entirety, thus minimizing impacts to many different habitats.

   Status – **To be completed**. The majority of the Pigeon Creek (Section 1), Patoka River (Section 2), Flat Creek (Section 2), Prairie Creek (Section 3), First Creek (Section 3), Doan’s Creek (Sections 3 and 4), Black Ankle Creek (Section 4), Dry Branch (Section 4), Plummer Creek (Section 4), Indian Creek (Section 4), and an unnamed tributary (UNT) to Clear Creek (aka May Creek) (Section 4) floodplains have been or will be bridged. Although no floodplains within Section 4 will be bridged in their entirety, floodplain encroachments have been minimized where reasonable through design practices such as longer bridges and perpendicular stream crossings. Although it is not anticipated that any floodplains within Section 5 will be bridged in their entirety, floodplain encroachments will be minimized where reasonable by utilizing existing bridge crossings and design practices such as longer bridges and perpendicular stream crossings where new crossings are warranted. Bridging allows for wildlife corridors and the greatest clearance is beneficial for bats to fly under these bridges.

d. **Stream Relocations –** Site-specific plans for stream relocations will be developed in design considering the needs of sensitive species and environmental concerns. Plans will include the planting of woody and herbaceous vegetation to stabilize banks. Such plantings will provide foraging cover for many species. Stream Mitigation and Monitoring plans will be developed for stream relocations, as appropriate.

   Status – **To be completed**. This will be completed during mitigation and permitting. The final design plans continue to be reviewed to assure conformance with the previously secured permits. Specific mitigation sites have been purchased in some sections. Note some of the mitigation regarding stream relocations occurring within maternity colonies is being conducted onsite using natural channel design.

4. *ALL HABITATS*

a. **Medians and Alignments –** Variable-width medians and independent alignments will be used where appropriate to minimize impacts to sensitive and/or significant habitats. Context sensitive solutions will be used, where possible. This may involve vertical and horizontal shifts in the Interstate.

Status – **To be completed**. This will occur where appropriate and possible in final design and construction in each section. These were not used for Sections 1 and 3. For Section 2, variable width medians were used in one area outside a maternity colony area. For Section 4, it was determined it was not appropriate to use variable-width medians given design constraints. A typical median width of 60 feet is proposed and no trees will be left in the median. For Sections 5 and 6, a typical median width of 60 feet is proposed. No trees will be left in the median for the majority of Section 5 with the exception of a small stretch (approximately 1.4 miles) of split roadway north of Burma Road and Bryant Creek Road in the Morgan-Monroe State Forest area. This split minimizes impacts to forest habitat, the State Forest, and streams.

Environmentally sensitive areas in Section 2 include the Patoka River National Wildlife Refuge, Flat Creek, Prides Creek, and the East Fork of the White River. Environmentally sensitive areas in Section 4 include Black Ankle Creek/Koleen Bottoms and all Indian Creek crossings. Environmentally sensitive habitats in Section 5 include   recharge areas.

b. **Minimize Interchanges** – Efforts have been made to limit interchanges in karst areas, thereby limiting access and discouraging secondary growth and impacts. In Tier 2, further consideration will be given to limiting the location and number of interchanges in karst areas.

Status – **Completed**. Only Sections 4 and 5 are located within the Karst Region. Interchanges in Section 4 include SR 45, Greene/Monroe County Line, and SR 37. Interchanges in Section 5 include Fullerton Pike, combined Tapp Road and SR 45/2nd Street, SR 48/3rd Street, SR 46, Walnut Street, Sample Road, and Liberty Church Road. Existing interchanges in Section 5 include SR45/2nd Street, SR 48/3rd Street, SR 46, and Walnut Street. These interchanges have been designed to limit impacts in karst areas. Specific design elements include folded ramps, the use of smaller urban-style interchanges in rural areas, and using existing interchange locations, overpasses and pavement layouts when possible. Liberty Church Road is not in karst terrain.

c. **Memoranda of Understandings (MOUs)** – Construction will adhere to the Wetland MOU (dated January 28, 1991) and Karst MOU (dated October 13, 1993). The Wetland MOU minimizes impacts to the northern long-eared bat by mitigating for wetland losses, and creating bat foraging areas at multiple ratios to those lost to the project. The Karst MOU avoids and minimizes impacts to the northern long-eared bat by numerous measures which protect sensitive karst features including hibernacula.

   Status – **To be completed**. This will be coordinated prior to or during construction. Procedures established in these MOUs will be adhered to during the planning phase and will be incorporated into the Mitigation and Monitoring Plan for each mitigation site. Coordination with the Karst MOU signatory agencies for Section 4 began in fall 2011 and is ongoing. Coordination with the Karst MOU signatory agencies for Section 5 is anticipated to start prior to construction.

d. **Water Quality** – Water contamination will be avoided/minimized by the following:
   1. **Equipment Service** – Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.

Status – **To be completed**. Procedural steps 1-4 of the Karst MOU are being addressed in Tier 2. In addition, this item will be incorporated as a special provision in all contracts, as applicable.

2. **Roadside Drainage** - Where appropriate in karst areas, roadside ditches will be constructed that are grass-lined and connected to filter strips and containment basins. The development of these measures will be coordinated with the Karst MOU agencies.

   Status – **To be completed**. In Section 4, roadside ditches may include geo-membrane lining, rock filters or detention basins. No roadside drainage will be directly discharged into a karst feature (dry well). Coordination with the Karst MOU signatory agencies for Section 4 began in fall 2011 and is ongoing. Specific impacts to karst features and treatment of drainage has not yet been determined for Section 5. Impacts to specific karst features in Section 5 will be addressed via consideration of alternative drainage and other appropriate mitigation features during final design. Such treatment measures include peat and sand filters, gravel filters, vegetated buffers, and lined spill or run-off containment structures.

3. **Equipment Maintenance** - Construction equipment will be maintained in proper mechanical condition.

   Status – **To be completed**. This item is contained in the INDOT Standard Specifications and will be implemented during construction.

4. **Spill Prevention/Containment** – The design for the roadway will include appropriate measures for spill prevention/containment.

   Status – **To be completed**. Special measures, including diversions of highway runoff from direct discharge off of bridge decks into streams and containment basins to detain accidental spills, will be incorporated into final design plans for perennial streams within the northern long-eared bat maternity colony areas to address water quality concerns. Within Section 1, this includes Pigeon Creek and its tributaries. Within Section 2, this includes Hurricane Creek, Patoka River, Flat Creek, Mud Creek, East Fork of the White River, Jackson Pond tributary, Veale Creek, and Hurricane Branch of Veale Creek. Within Section 3, this includes Weaver and Vertrees Ditches. Within Section 4, this includes Black Ankle Creek, Dry Branch, and the three most northern Indian Creek crossings. The remaining perennial streams, Plummer Creek, Mitchell Branch, the southernmost Indian Creek, an UNT to Clear Creek (aka Happy Creek), and an UNT to Clear Creek (aka May Creek) all fall within the WAA. Locations within Section 5 are still to be defined. Measures for spill prevention/containment will be included in the roadway design.

Contractors will be required to provide an acceptable spill response plan which will include telephone numbers for emergency response personnel and copies of agreements with any agencies which are part of the spill response effort. An emergency response telephone number is also required. The Rule 5 Permit will require each contractor have spill containment plans in their contract documents.

5. **Herbicide Use Plan** – The use of herbicides will be minimized in environmentally sensitive areas such as karst areas to protect northern long-eared bats and their prey. Environmentally sensitive areas will be determined in coordination with the INDOT, and as appropriate, the INDOT consultants. Appropriate signage will be posted along the interstate to alert maintenance staff of these areas.

   Status – **To be completed**. The use of herbicides will be minimized within environmentally sensitive habitats. In addition, the herbicide use plan will include any drainage area of a karst feature which is used for highway drainage. Appropriate signage will be posted along the interstate to alert maintenance staff of these environmentally sensitive areas. Within Section 2, this includes the Patoka River National Wildlife Refuge, Flat Creek, Prides Creek and the East Fork of the White River. Within Section 4, this includes Black Ankle

Creek/Koleen Bottoms and all Indian Creek crossings. Within Section 5, this includes recharge areas.

6. **Re-vegetation** – Re-vegetation of disturbed areas will occur in accordance with the INDOT standard specifications. Woody vegetation will only be utilized beyond the clear zone. Re-vegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers, as appropriate, similar to the native seed mixes of other nearby states.

   Status – **To be completed**. Re-vegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be used a reasonable distance beyond the clear zone to ensure a safe facility. Re-vegetation of disturbed soils within the right-of-way and medians will utilize native grasses and wildflowers as appropriate, such as those cultivated through INDOT's Roadside Heritage program. Within Section 2, locations include the SR 61/56 Intersection, North Pike, South Daviess, and US 50. Within Section 4, locations may include Black Ankle Creek, an UNT to Clear Creek (aka May Creek), and Indian Creek crossings. Other areas may include interchange locations. Locations within Section 5 are still to be defined.

7. **Low Salt Zones** – A low salt and no spray strategy will be developed in karst areas for this project. A signing strategy for these items will also be developed. The low salt zones will be determined in coordination with the INDOT.

   Status – **To be completed**. For Section 4, the BA states that low salt zones will be defined within any drainage area of a karst feature which is used for highway drainage within the karst region (Taylor Ridge Road north to SR 37—approximately 22.3 miles). For Section 5, the limits for the low salt/no spray zone in Section 5 will be along I-69 continuing from Section 4 to 200 feet north of the existing SR 37/Chambers Pike Intersection. Signs illustrating *Low Salt/No*

Spray Zone and *Report All Spills to 1-888-233-7745* were developed and approved by INDOT in 2011. For Section 4, *Low Salt/No Spray Zone* signs will be placed along both sides of the road (each travel direction) within the karst portion of the roadway, approximately three miles apart and at entrance ramps leading to the highway for a total of 24 signs.

Signs showing *Report All Spills to 1-888-233-7745* will be placed following the above recommendations but will be inserted in between the *Low Salt/No Spray Zone* signs for a total of 16 signs. Similar signs and spacing will be used within the karst areas of Section 5.

8. B**ridge Design** – Where feasible and appropriate, bridges will be designed with none or a minimum number of in-span drains. To the extent possible, the water flow will be directed towards the ends of the bridge and to the riprap drainage turnouts.

   Status – **To be completed**. This will be coordinated in the final design of bridges crossing perennial streams located within the maternity colony areas. For a list of these perennial streams, see "Spill Prevention/Containment" (#4 above).

e. **Erosion Control** – Temporary erosion control measures will be used to minimize sediment and debris. Timely re-vegetation after soil disturbance will be implemented and monitored. Re-vegetation will consider site specific needs for water and karst. Erosion control measures will be put in place as a first step in construction and maintained throughout construction.

   Status – **To be completed**. Best Management Practices (BMPs) will be used during construction to minimize impacts of erosion. Erosion control measures will be put in place as a first step in construction and maintained throughout construction. Temporary erosion control devices, such as silt fencing, check dams, sediment basins, inlet protection, sodding, and other appropriate BMPs will be used to minimize sediment and debris in tributaries and karst features within the project area.

Timely re-vegetation will be implemented after soil disturbance and monitored. Any riprap used will be a large diameter to allow space for habitat for aquatic species after placement. Slopes will be designed that resist erosion. If slopes exceed 2:1, they will include stabilization techniques. Soil bioengineering techniques for bank stabilization will be considered where situations allow.

In addition to the above measures, a video has also been prepared to help assure compliance with erosion control measures. This video will be viewed by personnel (i.e. engineering supervisors, equipment operators, construction personnel, INDOT maintenance) prior to construction activities in all Sections. Additional specifications have also been added to Section 4 contracts for erosion control.

f. **Parking and Turning Areas** – Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing, and will avoid environmentally sensitive areas, such as karst.

Status – **To be completed**. This will be identified in construction contracts.

B. *RESTORATION / REPLACEMENT*

1. *SUMMER HABITAT*

A. **Summer Habitat Creation/Enhancement** – Northern long-eared bat summer habitat will be created and enhanced in the Action Area through wetland and forest mitigation focused on riparian corridors and existing forest blocks to provide habitat connectivity. The following areas and possibly others have been investigated for wetland and forest mitigation to create and enhance summer habitat for the Indiana bat: Pigeon Creek, Patoka River bottoms, East Fork of the White River, Thousand Acre Woods, White River (Elnora), First Creek, American Bottoms, Garrison Chapel Valley, Beanblossom Bottoms, White River (Gosport), White River (Blue Bluff), and Bradford Woods. In selecting sites for Indiana bat summer habitat creation and enhancement, priority was given to sites located within a 2.5 mile radius from a recorded capture site or roost tree. If willing sellers cannot be found within these areas, other areas may be used as second choice areas as long as they are within the Action Area and close enough to benefit these maternity colonies, or are outside the

Action Area and still deemed acceptable to USFWS. Where appropriate, mitigation sites will be planted with a mixture of native trees largely comprised of species that have been identified as having relatively high value as potential northern long-eared bat roost trees. Tree plantings will be monitored for 5 to 10 years after planting to ensure establishment and protected in perpetuity via conservation easements.

Status – **To be completed**. This will occur during mitigation and permitting. Tree plantings are anticipated to be monitored for 10 years. Additional conceptual detail has been and will be provided in the Tier 2 BA for each section. In addition to the areas mentioned above,

, Veale Creek, Flat Creek, Indian Creek, Plummer Creek, Doan's Creek, areas adjacent to the White River, Little Clyfty Branch, Crooked Creek, Lambs Creek, Morgan-Monroe State Forest, Beanblossom Nature Preserve, and Maple Grove Road Rural Historic District were investigated for wetland and forest mitigation possibilities in order to enhance summer habitat for the northern long-eared bat. Specific mitigation sites have already been purchased in some sections. Coordination with interested landowners is ongoing. Mitigation sites for the Indiana bat are considered mitigation sites for the northern long-eared bat.

B. **Wetland MOU** – Wetlands will be mitigated at ratios agreed upon in the Wetland MOU (dated January 28, 1991). Wetland replacement ratios are as follows:

1. Farmed 1 to 1.
2. Scrub/shrub and palustrine/lacustrine emergent 2 – 3 to 1 depending upon quality.
3. Bottomland hardwood forest 3 – 4 to 1 depending upon quality.
4. Exceptional, unique, critical (i.e. cypress swamps) 4 and above to 1 depending upon quality.

Status – **To be completed**. This will occur during mitigation and permitting. Additional conceptual detail will be provided in the Tier 2 BA for each section. Specific mitigation sites have already been purchased in some sections.

C. **Forest Mitigation** – The Tier 1 Forest and Wetland Mitigation and Enhancement Plan identifies the general location of potential mitigation sites for upland and bottomland forests. Preference will be given to areas contiguous to large forested tracts that have recorded federal and state listed species. The actual mitigation sites implemented will be determined in Tier 2 in consultation with the Service and other environmental review agencies. Coordination with the environmental review agencies will assure that these forest mitigation sites are strategically situated in biologically attractive ecosystems. Forest impacts will be mitigated at a ratio of 3 to 1. All forest mitigation lands will be protected in perpetuity via conservation easements. The 3:1 forest mitigation may not be located entirely within the Action Area. Forest impacts occurring within each of the northern long-eared maternity colony areas would be mitigated by replacement (i.e. planting of new forest and purchase of existing) at approximately 3:1, preferably in the vicinity of the known roosting habitat.

Status – **To be completed**. This will occur during mitigation and permitting. Additional conceptual detail will be provided in the Tier 2 BA for each section. Coordination with USFWS has indicated that of this 3:1 ratio, 2:1 may be preservation, while restoration is at a minimum of no net loss or 1:1. In addition to conservation easements, deed restrictions may also be used to protect mitigated lands. Specific mitigation sites have already been purchased in some sections for the Indiana bat and are anticipated also to be accepted as mitigation sites for the northern long-eared bat.

C. <u>CONSERVATION / PRESERVATION</u>

1. *<u>WINTER HABITAT</u>*

A. **Hibernacula Purchase** – Opportunities will be investigated to purchase at fair market value from “willing sellers,” Indiana bat and northern long-eared bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and implementation of all management efforts, hibernaculum(a) and all buffered areas will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

Status – **Completed**. Property owners of Indiana bat hibernacula within and outside the WAA were contacted to determine if they are interested in being willing sellers. Conservation easements have been purchased for

Note that contrary to expectations described in previous documents, the property owner of chose not to have I-69 mitigation on his property in 2011 and the property owner of

chose not to include the cave within the mitigation boundary.

is a wet cave adjacent to Indian Creek that had 3 harp trapped northern long-eared bats in 2004 and 1 Indiana bat and in 2005. The owners of

are not willing sellers. There are three caves that are currently managed by federal/state/local agencies and/or environmental organizations; these include The property owners of

were also contacted, but were either not interested in selling/giving easements or did not respond. These caves also are hibernacula for the northern long-eared bat, so the purchase of

benefit the northern long-eared species.

In addition, FHWA and INDOT have improved the opening of for greater air flow and cooler temperatures. It is a suspected northern long-eared bat hibernaculum based on August 2004 harp trap data obtained for the I-69 project. In the purchase of these caves, FHWA and INDOT have also purchased 100's of acres of high quality foraging areas for both the Indiana bat and the northern long-eared bat and protected hundreds of karst-related features from potential development.

B. **Hibernacula Protection** – With landowner permission, investigations will coordinate with the USFWS on acquiring easements to erect bat-friendly angle-iron gates at cave entrances. These gates prevent unauthorized human access and disturbance of hibernacula, while maintaining free airflow within the hibernacula within the Action Area. Gates will be constructed according to designs from the American Cave Conservation Association. Effects of gates on water flow and flash flooding debris will be carefully evaluated before and after gates are installed. Other structures (e.g., perimeter fencing) or techniques (e.g., alarm systems and signs) may be used.

Status – **To be completed**. Fencing has been installed at the entrance to In 2012, the large rocks were removed from the entrance of to allow for greater airflow and lower temperatures which could create conditions more conducive for northern long-eared bats and Indiana bats. USFWS has already installed data loggers for background temperature measurements. Studies from 1982 to present have not observed Indiana bats in , but it is considered a hibernaculum for the northern long-eared bat. is currently being evaluated to determine the need for a gate.

2. *AUTUMN/SPRING HABITAT*

A. **Autumn/Spring Habitat Purchase** – Any hibernaculum(a) purchased as part of conservation for Indiana bat or northern long-eared bat winter habitat will include associated autumn swarming/spring staging habitat to the maximum extent practicable. Any purchase will be from a willing seller at fair market value. In addition, some parcels containing important autumn swarming/spring staging habitat may be acquired near key hibernacula regardless of whether the hibernacula themselves are acquired. Any acquired autumn swarming/spring staging habitat would be conveyed to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. The purchase of forestland would be included as part of the 3:1 mitigation.

Status – **Completed**. Conservation easements have been purchased for

Note that contrary to expectations described in previous documents, the property owners of chose not to have I-69 mitigation on their properties in 2011 and the property owner of chose not to include the cave within the mitigation boundary.

3. *SUMMER HABITAT*

A. **Summer Habitat** – Investigations will be coordinated with the USFWS on purchasing lands at fair market value in the Action Area from "willing sellers" to preserve summer habitat. Any acquired summer habitat area will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

Status – **To be completed**. This will occur during mitigation and permitting. Additional conceptual detail will be provided in the Tier 2 BA for each section. Specific mitigation sites (containing summer habitat) have already been purchased in some sections.

D. EDUCATION / RESEARCH

1. *WINTER HABITAT*

A. **Monitor Gated Caves** – All caves that have gates erected as mitigation for this project will have their temperature, humidity, bat activity and populations monitored before and for three years after gate installation. Infra-red video monitoring or other techniques deemed acceptable by the USFWS will be conducted for a minimum of two nights in the appropriate season at each newly installed cave gate to ensure the bats are able to freely ingress and egress. Data acquisition will use a number of data loggers minimizing the need for entry into these caves. All precautionary measures will be taken to minimize potential impacts to hibernating Indiana bats and northern long-eared bats.

Status – **To be completed**. is currently being evaluated to determine the need for a gate. Coordination with the new property owner regarding use limitations and the ongoing monitoring has been completed; follow-up coordination for a review of the cave is planned in 2014. Currently, no other cave gates are anticipated as part of I-69 mitigation. However, review of will be conducted with Bat Conservation International (BCI) and USFWS for input during review of which is a known hibernacula for the northern long-eared bat.

B. **Cave Warning Signs** – Where deemed appropriate by USFWS, the following may be done: signs will be posted that warn the public and discourage cave entry at hibernacula within/near the Action Area. Signs should be placed so that they do not block airflow into the cave and do not draw attention to the entrance and attract violators (USFWS, 1999). Also, light-sensitive data loggers may be placed within the caves to assess the effectiveness of the warning signs at deterring unauthorized entries. Permission from the landowners must be obtained before erecting such signs and installing data loggers.

Status – **To be completed**. This can be completed any time prior to or during construction of the roadway. In cooperation with the property owner (who is not a willing seller), the entrance to is currently being monitored for unauthorized access. A camera and warning signs are installed at the entrance to fencing with warning signs are installed at the entrance to , and warning signs are installed at . As a result of conversations between INDOT and USFWS, a warning sign was placed at the entrance to in 2012 by USFWS. A warning sign was also placed at the entrance to in 2012.

C. **Biennial Census** – Total funding of $50,000 will be provided to supplement the biennial winter census of hibernacula within/near the proposed Action Areas. Funding will be made available in consultation with the USFWS.

Status – **To be completed**. A MOU was prepared between INDOT and USFWS for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by USFWS.

2. *AUTUMN/SPRING HABITAT*

A. **Autumn/Spring Habitat Research** – Total funding of $125,000 will be provided for research on the relationship between quality autumn/spring habitat near hibernacula and hibernacula use within/near the Action Area. This research should include methods attempting to track bats at longer distances such as aerial telemetry or a sufficient ground workforce. A research work plan will be developed in consultation with the USFWS. Funding will be made available as soon as practical after Notice to Proceed is given to the construction contractor for the applicable Tier 2 Section (or earlier).

Status – **To be completed**. A MOU was prepared between INDOT and USFWS for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by USFWS

3. *SUMMER HABITAT*

   A. **Mist Netting** – A work plan for surveying, monitoring, and reporting will be developed and conducted in consultation with and approved by the USFWS. This mist netting research will be in addition to Tier 2 sampling requirements. Fifty-two mist netting sampling sites are presently under consideration. In earlier discussions, FHWA/INDOT agreed with USFWS to complete surveys at 50 mist netting sites; however, 2 additional sites have been added to the list as recommended by USFWS. To limit the number of surveyed sites to 50, possibly 2 sites can be removed in Section 6. Monitoring surveys focused at known maternity colonies will be completed the summer before construction begins in a given section and will continue each subsequent summer during the construction phase and for at least five summers after construction has been completed. If Indiana bats are captured in any section, or northern long-eared bats are captured in Section 5 (as well as in Section 6 when construction occurs there), radio transmitters will be used in an attempt to locate roost trees, and multiple emergence counts will be made at each located roost tree. These monitoring efforts will be documented and summarized within an annual report prepared for the Service.

   Status – **To be completed**. Surveys will be conducted pre-construction, during construction and for five years post-construction. Pre-construction surveys will be conducted within the summer bat mist netting season immediately prior to the start of construction activities (including tree clearing) for any given construction contract. Surveys during construction will be conducted each year up to the year that the highway is open to traffic. The first of the five post-construction surveys will begin the summer following completion of the Section when the highway is open to traffic. Sites for this additional sampling include the following:

Section and Sites	# of Sites
Section 1 – Sites 3, 3B, 4C and 5	4
Section 2 – Sites 6, 7, 8, 11, 12, 12B, 14, 22, 29, and 30	10
Section 3 – Sites 11, 13, 14, 15, 18, 19, 21, and 23	8
Section 4 – Sites 2, 3, 8, 11, 14A, 18, 21, 23, 24, 27A, and 28	11
Section 5 – Sites 2, 4, 6, 14A, 17, 19, 22 and 24	8
Section 6 – Sites 5, 7, 8, 10, 13, 14, 17, 19, 20, 22 and 23	11
Total	52

Sections 1 through 5 pre and post-construction mist netting sites have been approved by USFWS. Pre-construction mist netting was completed in 2008 for Section 1, while construction year mist netting was completed in 2009 through 2012 for four sites in Section 1. In 2012, Site 4 was replaced with Site 4C. Pre-construction mist netting was completed in 2010 for Sections 2 and 3, while construction year mist netting was completed in 2011 and 2012. The 2013 survey for Sections 1, 2, and 3 represents the first year of post-construction monitoring since the highway was open to traffic in 2012. In 2013, Site 22 for Section 3 was replaced with Site 23 due to lack of property owner access permission. Pre-construction mist netting for Section 4 (Sites 2, 3, 8, 11 and 14) was completed in 2010. Due to the location of construction segments scheduled for the fall-winter-spring of 2011 and 2012, the pre-construction survey for Site 18 was conducted in 2011. Similarly, pre-construction for Sites 21, 23, 24, 27A and 28 was completed in 2012. In 2012, Site 14 was replaced with Site 14A due to lack of property owner access permission. The 2013 survey for Section 4 (11 sites) represents a construction year monitoring effort. Mist netting was completed for 24 sites in Section 5 in 2012. The 2012 survey is anticipated to serve as the pre-construction survey in Section 5.

Note that three additional maternity colonies have been found since the original 13 colonies were identified in 2004 and 2005. They are associated with Clyfty Creek (Section 4), Beanblossom Nature Preserve (Section 5), and Lambs Creek (Section 5). No additional maternity colonies were found in 2013. The

Beanblossom Nature Preserve colony was discovered by the USFWS and requested by them to be added to the I-69 colonies.

For the northern long-eared bat, USFWS has identified 38 maternity colonies associated with I-69. These are broken down as follows:

Section 1
- Pigeon Creek South
- Pigeon Creek North

Section 2
- Patoka South Fork
- Robinson South
- Robinson North
- Flat Creek
- East Fork White River
- Aikman Creek

Section 3
- Thousand Acre Woods
- North Fork Prairie Creek
- Smothers Creek
- White River – Weaver Ditch
- White River – Fourmile Creek
- First Creek West
- First Creek East
- Doans Creek West

Section 4
- Bogard Creek
- Doans Creek East
- Black Ankle Creek
- Plummer Creek
- Mitchell Branch
- Little Indian Creek Monroe
- Indian Creek South
- Indian Creek West
- Indian Creek North

Section 5
- Beanblossom East
- Beanblossom West
- Indian Creek Morgan
- Bryant Creek South
- Little Indian Monroe
- Bryant Creek North
- Jordan Creek
- Little Indian Creek Morgan
- Lambs Creek

Sections 6
- Clear Creek East Fork
- White River
- White River – Goose Creek
- Pleasant Run

4. *GENERAL*

A. **Educational Materials** – Total funding of $25,000 will be provided for the creation of an educational poster or exhibit and/or other educational outreach media to inform the public about the presence and protection of bats, particularly the Indiana bat and northern long-eared bat. Funding would be provided after a Notice to Proceed is issued for construction of the first section of the project.

Status – **To be completed**. The name of this conservation measure was changed to “Educational Poster” per request from USFWS in 2009. USFWS indicated they would like to finalize the posters. A MOU was prepared between

INDOT and USFWS for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by USFWS.

B. **Rest Areas** – Rest areas will be designed with displays to educate the public on the presence and protection of sensitive species and habitats. Attractive displays near picnic areas and buildings will serve to raise public awareness as they utilize I-69. Information on the life history of the Indiana bat, protecting karst, and protecting water quality will be included in such displays.

Status – No rest areas are being proposed.

C. **Access to Patoka NWR** – If reasonable, an interchange will be constructed that would provide access to a potential Visitor's Center at the Patoka River National Wildlife Refuge.

Status – **Completed**. Interchanges within the vicinity of the Patoka River National Wildlife Refuge include signage directing motorists to the Refuge's office. The nearest interchange to the Patoka River National Wildlife Refuge is at SR 64, west of Oakland City. Another interchange is south of Petersburg, at SR 57. The SR 64 interchange has this directional signage.

D. **GIS Information** – GIS maps and databases developed and compiled for use in proposed I-69 planning will be made available to the public. This data provides information that can be used to determine suitable habitats, as well as highlight other environmental concerns in local, county, and regional planning. Digital data and on-line maps were made available from a server accessed on the IGS website at IU: http://igs.indiana.edu/arcims/statewide/index.html. In addition, detailed GIS forest data (five meter resolution) has been developed for the 13 maternity colony foraging areas (circles with 2.5 mile radius) and WAA; and as part of this Tier 1 BA Addendum for the northern long-eared bat, 38 maternity colonies (1.5 mile radii) are analyzed for indirect and cumulative in Sections 1-4, and those in Section 5 and 6 will have direct, indirect and cumulative impact analysis. This data was developed in order to better determine habitat impacts to the Indiana bat and the northern long-eared bat.

This is the most accurate and detailed forest data known to exist for those areas. This data could potentially be used by the USFWS, other government agencies, or students to examine effects on the Indiana bat, northern long-eared bat, other species, or ecosystems over time.

Status – **Completed**. The website is: http://www.indianamap.org/

Administrative Activities and Section 7 Consultation

The following action items or administrative activities need discussed with USFWS, INDOT and FHWA:

INDOT and FHWA have committed $270,000 for conservation measures, not including habitat (e.g., cave, wetland, forest, and prairie) replacement. The $270,000 is broken down as follows:

1.	Biennial Census	$50,000
2.	Autumn/Spring Habitat	$125,000
3.	Educational Poster of Indiana Bat	$25,000
4.	Bald Eagle Pamphlet	$25,000
5.	Eastern Fanshell Pamphlet	$25,000
6.	Captive-Rearing Research	$20,000

Status – To be completed. A MOU was prepared between INDOT and USFWS for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by USFWS.

Project Schedule

The Final Environmental Impact Statements (FEIS) and Record of Decisions (ROD) for Sections 1 through 5 are complete. Construction of Sections 1, 2 and 3 is complete and construction of the roadway in Section 4 to Bloomington should be completed in 2015. Construction of Section 5 is expected in 2014 to 2017.

Consultation History

Federally listed species are protected under Section 7 of the Endangered Species Act (ESA). Section 7 directs all federal agencies to use their existing authorities, in consultation with the USFWS, to conserve threatened and endangered species, and to ensure that their actions do not jeopardize the continued existence of listed species or significantly impact or adversely modify critical habitat. During the original Tier 1 study, both formal and informal consultations with the USFWS were conducted. A BA was submitted to USFWS on March 26, 2003 for its review. The BA described the Indiana bat, bald eagle, and eastern fanshell mussel. The USFWS reviewed the Draft BA and provided comments to FHWA and INDOT on May 30, 2003. The document was revised and a Final BA was submitted to the USFWS on July 18, 2003.

The conclusion of this initial process included the issuance by USFWS of a Tier 1 BO. This formal consultation determined (for the three (3) federally-listed species potentially affected by the project) that the project was not likely to adversely affect the eastern fanshell mussel, or that any effects were not likely to jeopardize the continued existence of the Indiana bat or bald eagle. This formal consultation also provided for FHWA and INDOT to submit a Tier 2 BA for each Tier 2 Section. Each Tier 2 Section BA will show how the impacts associated with each particular section are consistent with those described in the original Tier 1 BO.

A meeting was held on July 1, 2005 with FHWA, INDOT, and the USFWS to discuss Section 7 consultation during Tier 2 studies for the I-69 Evansville to Indianapolis project. At this meeting, USFWS stated that FHWA and INDOT should consider re-initiating formal Section 7 consultation for the entire I-69 corridor from Evansville to Indianapolis. USFWS stated that re-initiation was needed for the Indiana bat based upon the new field information collected in 2004 and 2005 concerning that species. Such new information includes results from mist netting, roost tree identification, roost tree emergence counts, and bridge surveys for Indiana bat summer habitat, and results from fall/spring cave harp trapping and cave surveys for Indiana bat winter habitat. USFWS indicated that the formal consultation process would conclude with USFWS issuing a revised BO for the entire Alternative 3C corridor. Such informal and formal consultation included a Tier 1 BA Addendum dated March 7, 2006 including all field data and appropriate information. It also included a Revised Tier 1 BO dated August 24, 2006.

Since that time, FHWA and INDOT have completed Tier 2 BAs on specific sections with returned BOs from USFWS on these dates:

Section	Date BA submitted to USFWS	Date BO returned by USFWS
1	June 6, 2007	August 29, 2007
2	November 25, 2009	February 17, 2010
3	July 27, 2009	October 21, 2009
4	November 1, 2010	July 6, 2011
5	December 19, 2012	July 25, 2013

The purpose of this document is to provide documentation on the northern long-eared bat presence within the I-69 study area as part of the conferencing process. . Such information will be used by USFWS to provide FHWA and INDOT a conference opinion and a jeopardy decision for the northern long-eared bat and the proposed action. An incidental take statement will be developed and take effect once the species is formally listed.

Table 2 provides a summary of NEPA and Section 7 Consultation history for I-69.

Table 2: Summary of NEPA and Section 7 Consultation History for I-69, Tier 1 & Tier 2

Date	Event / Action
May 18, 1999	Agency review meeting held to discuss tiered approach for this project.
January 5, 2000	Notice of Intent to undertake Tier 1 NEPA study for I-69 between Evansville and Indianapolis is published in Federal Register.
February 3, 2000	INDOT and FHWA hosted a “Scoping Meeting” with environmental review agencies.
June 5, 2001	INDOT and FHWA convened an agency review meeting to discuss the “Purpose and Need Statement.” A substantial portion of this meeting was devoted to discussing the type of agency coordination required in Tier 1 and Tier 2 of this study. The specific requirements of each agency were discussed in terms of its legal and regulatory responsibilities.
November 27, 2001	INDOT and FHWA convened an agency review meeting to discuss their “Screening of Alternatives” for I-69 (included environmental information).
December 21, 2001	BFO sent comments on the Draft Level 2 Alternatives Analysis Report for the Evansville to Indianapolis I-69 study including endangered species and Critical Habitat technical information.
March 14, 2002	Federally listed species reviewed and appropriate tables constructed with species, their number and status and presented to the USFWS at the BFO.

Table 2: Summary of NEPA and Section 7 Consultation History for I-69, Tier 1 & Tier 2

Date	Event / Action
June 4 and 5, 2002	A BFO biologist took a two-day bus tour of I-69 alternatives focused on environmentally sensitive areas with INDOT, FHWA, United States Environmental Protection Agency (USEPA), and Indiana Department of Natural Resources (IDNR).
June 2002	Through informal consultation with the USFWS, INDOT agreed to shift the common alignment of Alternative 3A, B, and C to be beyond the range of bats that forage around and hibernate in a cave that is Designated Critical Habitat for the Indiana bat in Greene County.
June 27, 2002	FHWA sent a letter to BFO requesting a list of federally-listed species and Designated Critical Habitat that may be present in the I-69 Study Area of five alternatives being carried forward for detailed analysis in the DEIS.
July 1, 2002	BFO sent FHWA a species list for all five alternatives that included six species and one cave Designated Critical Habitat for the Indiana bat that may be present within the proposed project counties.
July 31, 2002	INDOT and FHWA released their Tier 1 DEIS for public comment. The DEIS had been approved on July 22.
November 14, 2002	The BFO's comments on the Tier 1 DEIS are combined with those of the National Park Service and sent in a single letter from the Department of the Interior's Washington Office to FHWA.
January 9, 2003	Gov. Frank O'Bannon announced Alternative 3C as INDOT's recommendation as the "preferred alternative" for I-69.
February 21, 2003	FHWA requests a species list for their preferred alternative, 3C.
February 28, 2003	FHWA sends BFO a letter requesting comments regarding the four variations of Alternative 3C around the City of Washington.
March 11, 2003	An Agency Coordination Meeting held at BFO to discuss a Conceptual Tier 1 Forest and Wetland Mitigation Plan, Sections of Independent Utility, the proposed Patoka River crossing, and how the Section 7 consultation would be undertaken.
March 13, 2003	BFO sent FHWA a letter listing three species that may be present in the Alternative 3C Study Area: Indiana bat, bald eagle, and fanshell mussel.
March 14, 2003	BFO sent FHWA a letter recommending that it choose one of the two eastern routes around Washington (variation "WE1" was specifically recommended) as they were less likely to have adverse affects to Indiana bats or bald eagles because impacts to forest and wetlands would be smaller.
March 26, 2003	BFO was sent a Draft BA addressing effects to Alternative 3C on Indiana bats, bald eagles, and fanshell mussels and requested review and comments.
May 30, 2003	BFO returned comments on Draft BA.
June 15 – July 2003	BFO assisted INDOT and FHWA in developing Conservation Measures to be included in the BA that would avoid and minimize incidental take of Indiana bats and bald eagles.

Table 2: Summary of NEPA and Section 7 Consultation History for I-69, Tier 1 & Tier 2	
Date	**Event / Action**
July 21, 2003	BFO received a revised BA and letter from FHWA requesting formal Section 7 consultation for the effects of Alternative 3C of I-69 on Indiana bats and bald eagles. The letter also requested concurrence that fanshell mussels were not likely to be adversely affected by Alternative 3C. The 135-day period for formal consultation began.
August 22, 2003	BFO sent FHWA a letter acknowledging receipt and completeness of formal consultation initiation package. Informed FHWA that the USFWS expected to provide them with a final BO no later than December 3, 2003. Based on information contained in the BA, the USFWS also provided the FHWA written concurrence with their determination that the fanshell mussel was "not likely to be adversely affected" by the proposed construction, operation, and maintenance of Alternative 3C of I-69.
August – November 2003	BFO consulted with FHWA/INDOT to gain clarification on various issues resulting in several revisions to the Tier 1 BA.
November 28, 2003	BFO sent FHWA/INDOT a draft BO for review.
December 2, 2003	FHWA/INDOT returned comments on the draft BO to BFO.
December 3, 2003	BFO sent FHWA/INDOT the Final BO for Alternative 3C of I-69.
December 2003	INDOT released the FEIS with Alternative 3C named as its preferred alternative.
March 2004	FHWA issued a Record of Decision approving the 3C corridor.
Summer 2004	Tier 2 mist net surveys revealed the presence of 13 maternity colonies and scattered occurrences of male Indiana bats throughout the 3C corridor.
Fall-Winter-Spring 2004 and 2005	Tier 2 surveys at caves within five miles of the 3C corridor revealed limited seasonal use by Indiana bats at a small number of caves without previous documented use by Indiana bats.
Summer 2005	Additional mist netting and radio tracking located additional Indiana bat roost trees within the 13 maternity colony areas.
July 1, 2005	FHWA and INDOT met with USFWS and agreed to reinitiate formal consultation on Tier 1 of I-69 in light of all the new information on Indiana bat maternity activity and hibernacula in the project area.
Fall 2005	BFO and project consultant staff held weekly meetings to guide development of the Tier 1 BA Addendum.
February 2006	FHWA, INDOT, and USFWS signed a Pre-consultation Agreement.
March 7, 2006	FHWA submitted a Tier 1 BA Addendum to the USFWS with a letter requesting to reinitiate formal consultation for the Indiana bat.

Table 2: Summary of NEPA and Section 7 Consultation History for I-69, Tier 1 & Tier 2	
Date	**Event / Action**
June & July 2006	BFO consulted with FHWA/INDOT/project consultants to gain clarification on various issues discussed within the BA Addendum.
July 10, 2006	BFO reviewed and submitted comments on the Tier 1 Re-evaluation Report for I-69, which outlined anticipated impacts resulting from the interstate being a toll road.
July 17, 2006	BFO met with FHWA/INDOT/project consultants to discuss findings of the Tier 1 Re-evaluation report and other issues. It was agreed to expand the WAA to include an additional cave, which would necessitate FHWA/INDOT/project consultants to provide additional data to BFO and an effects determination on the cave as Critical Habitat. It was mutually agreed to extend the formal consultation period to accommodate these changes.
July 20, 2006	BFO received a letter from FHWA stating that it determined that I-69 "may effect, but is not likely to adversely affect" the cave as Critical Habitat for the Indiana bat. Additional information was provided regarding impacts around this cave and revised data for the revised WAA.
July 26, 2006	USFWS provided FHWA a Draft of the revised Tier 1 BO and Incidental Take Statement for review.
August 10, 2006	FHWA/INDOT return comments on the draft revised Tier 1 BO to BFO.
August 24, 2006	BFO sent FHWA/INDOT the final Revised Tier 1 BO for Alternative 3C of I-69.
May 18, 2007	BFO sent FHWA a letter noting intention to prepare an individual Tier 2 BO for each Tier 2 section BFO concludes will be likely to adversely affect the Indiana bat and/or bald eagle. Each will be a stand-alone document rather than being appended to the 2006 revised Tier 1 BO.
June 6, 2007	BA for Section 1 was submitted to USFWS (BFO) and Formal Section 7 Consultation began
August 29, 2007	BO for Section 1 Finalized by USFWS (BFO)
July 27, 2009	BA for Section 3 was submitted to USFWS (BFO) and Formal Section 7 Consultation began
October 21, 2009	BO for Section 3 Finalized by USFWS (BFO)
November 25, 2009	BA for Section 2 was submitted to USFWS (BFO) and Formal Section 7 Consultation began
February 17, 2010	BO for Section 2 Finalized by USFWS (BFO)
November 1, 2010	BA for Section 4 was submitted to USFWS (BFO) and Formal Section 7 Consultation began

Table 2: Summary of NEPA and Section 7 Consultation History for I-69, Tier 1 & Tier 2

Date	Event / Action
April 11, 2011	FHWA sent BFO a letter requesting re-initiation of formal Tier 1 consultation for the Indiana bat. The re-initiation request was based on new maternity colony information, as well as documentation of the newly discovered disease White Nose Syndrome (WNS) within the action area.
April 12, 2011	BFO sent FHWA a letter acknowledging receipt of April 11, 2011 letter and stating it plans to amend the Tier 1 Revised Programmatic BO (dated August 24, 2006).
May 18, 2011	Draft Amendment to the Tier 1 Revised Programmatic BO (dated August 24, 2006) sent to FHWA/INDOT for review.
May 23, 2011	FHWA/INDOT returned comments on the Draft Amendment to the Tier 1 Revised Programmatic BO (dated August 24, 2006) to BFO.
May 25, 2011	BFO sent FHWA/INDOT the final Amendment to the Tier 1 Revised Programmatic BO (dated August 24, 2006).
July 6, 2011	BO for Section 4 Finalized by USFWS (BFO)
Summer 2012	Mist netting completed for Section 5
December 19, 2012	Section 5 Tier 2 BA was submitted to the USFWS
May 20, 2013	FHWA sent BFO letter requesting re-initiation of formal Tier 1 consultation for the Indiana bat. The re-initiation request was based on the identification of two new maternity colonies in Section 5, exempted levels of take, and documentation for private property owner tree clearing in Section 4.
July 11, 2013	BFO sent Draft Amendment 2 to the Tier 1 Revised Programmatic BO (dated August 24, 2006) to FHWA/INDOT for review.
July 16, 2013	FHWA/INDOT returned comments on the Draft Amendment 2 to the Tier 1 Revised Programmatic BO (dated August 24, 2006) to BFO.
July 16, 2013	BFO sent Draft Tier 2 Section 5 BO to FHWA/INDOT for review.
July 19, 2013	FHWA/INDOT returned comments on the Tier 2 Section 5 BO to BFO
July 24, 2013	BFO sent FHWA/INDOT the final Amendment 2 to the Tier 1 Revised Programmatic BO (dated August 24, 2006).
July 25, 2013	BFO sent FHWA/INDOT the final Section 5 Tier 2 BO.
April 9, 2014	Meeting at USFWS (BFO) with FHWA/INDOT on the northern long-eared bat

Note: BFO = Bloomington Field Office, USFWS

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Changes since the Tier 1 BA Addendum in 2006

This chapter includes the following topics:

Introduction

Since the submittal of the Tier 1 BA Addendum in March 7, 2006 and a returned Revised Programmatic BO from USFWS on 24 August, 2006, INDOT and FHWA have worked to complete all “Terms and Conditions”, conduct field surveys, and acquire excellent biologically attractive areas for mitigation. The following information is offered for changes that have occurred since the Tier 1 BA Addendum in March 7, 2006.

Sampling Efforts, Maternity Colonies, Roost Trees and Mitigation

EFFORT (Exhibit 1) - INDOT/FHWA evaluated 259 bridges for roosting bats in the SAA. Seven (7) bridges showed a small number of bats from 4 species (northern long-eared bat, little brown bat, big brown bat and tri-colored bat). The most studied bridge was the . Efforts at this bridge included 118 visits in 6 years (2006-11) with over 8,500 bats recorded from 5 species (Indiana bat, gray bat, little brown bat, big brown bat and tri-colored bat). It also included the Installation of a 6 foot fence enclosure and signage to protect Indiana bat habitat. A 24-hour study was completed for diurnal activity. Temperatures, humidity, light measurements, noise levels and gap measurements were conducted to learn more about roosting of bats under bridges.

Summer mist netting included 189 sampling sites over 9 years (2004 to 2014) totaling 386 survey events that equaled 1,548 net nights or 774 nights. Radio-telemetry tracking on Indiana bats was conducted for 88 days to determine roost trees which led to the identification of 98 primary, alternative and unclassified roosts. Roost emergence counts were conducted on 92 roosts for a total of 325 roost survey nights. Sixteen maternity colonies were determined (including the USFWS colony at Beanblossom Bottoms Nature Preserve).

Winter cave surveys included evaluating a database of 330 caves and adding 41 new caves and 2 railroad tunnels totaling 373 caves. Biologists visited 250 caves to evaluate caves against known Indiana bat hibernacula criteria (e.g., ventilation, temperature, etc.). Within 76 caves, biologists conducted harp trap surveys at 74 cave entrances and completed internal surveys at 73 caves. The northern long-eared bat was the most abundant in number of individuals harp trapped at 1,015 individuals; Indiana bat ranked low at 21 individuals. Indiana bats and northern long-eared bats were found often in the same caves, e.g.,

. Northern long-eared bats were found hibernating in

DISTRIBUTION (Exhibit 1) - Sampling of the bridge over the was performed in monthly visits throughout 6 years including all 4 seasons, while summer mist netting included sampling sites located on an average of about 0.75 sites per mile apart within the SAA. At 87% of the survey sites where Indiana bats were caught, a northern long-eared bat would be caught, and 68% of the reproductive female or juvenile northern long-eared captures were within an Indiana bat maternity colony. Relative abundance for these 2 species was 339 northern long-eared (8% of total) and 112 Indiana bats (3% of total). Winter cave surveys included censuses and harp trapping the Crawford Upland and Mitchell Karst Plain physiographic regions in Greene, Monroe and Lawrence counties. Dye tracing studies were conducted to establish connectivity with proposed roadway.

SEASONALITY (Exhibit 1) - Sampling of the large bridge over the over time included spring and summer “Stop Over” for Indiana bat and other bats at bridge for feeding, mating, rest and protection**.** For the 6-year study, no northern long-eared bats were observed even though they are common in the area. Summer mist netting included summer May 15 to August 15 within the SAA. The SAA was a 5-mile wide band for Indiana bats. Winter cave surveys and harp trapping were conducted in 2004 Fall, 2004-05 Winter, 2005 Spring, 2005 Fall and 2005-06 Winter in karst/cave topography in the Study Area.

MATERNITY COLONIES (Exhibit 2) - Maternity colonies for the Indiana bat totaled 16, while for the northern long-eared bat, USFWS Bloomington Field Office determined 38 colonies. These are shown in Exhibits 2 and 3. Indiana bat maternity colonies and northern long-eared bat maternity colonies were similar in Sections 1, 2, 4 and 6, but showed some variance in Sections 3 and 5. In Section 3, the northern long-eared bats were present in the gap between Washington and West Fork White River (Elnora) Indiana and the Indiana bat colony east of US 231. In Section 5, no maternity colonies for either species were found in the lower third, although males of both species were found there.

MITIGATION (Exhibit 2) - Mitigation efforts included purchasing 50 mitigation sites totaling approximately 5,528 acres (=8.6 square miles) in Sections 1-4. Twenty-five mitigation properties are currently being evaluated in Section 5 that equals at this time about 2,100 acres or about 3.3 square miles. INDOT and FHWA have also purchased 4 Indiana bat hibernacula that protect about 32,000 Indiana bats and an additional cave where the entrance has been modified to promote cooler temperatures in cave. Three of the above four purchased caves are also hibernacula for the northern long-eared bat (i.e.,) protecting many northern long-eared bats. In addition, the additional cave that had its entrance opened is a known hibernacula for the northern long-eared bat.

All mitigation properties provide opportunities for preservation of existing forests, reforestation and wetland/stream development and helping protect existing and future habitat for the Indiana bat and northern long-eared bat, other wildlife and plants, and karst/groundwater resources. All mitigation properties have been approved by the USFWS as good to excellent habitat for the Indiana bat and are in or near existing maternity colonies for the Indiana bat and for the northern long-eared bat. Mitigation properties are either Fee Simple or Conservation Easement. INDOT and FHWA are helping the Patoka River National Wildlife Refuge acquire lands now and in the future of which 565 acres are planned as mitigation to be turned over to the refuge. In addition, a 355-acre mitigation site along the West Fork will become an IDNR property upon its release from monitoring as a successful site. These two species are most numerous in these two mitigation areas.

Northern Long-Eared Bat SAA and WAA Defined

The Action Area for a project is defined by regulation as all areas to be affected directly or indirectly by the Federal Action and not merely the immediate area involved in the action. This analysis is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. Two seasonal Action Areas have been defined for the proposed endangered northern long-eared bat: (1) the SAA and (2) the WAA. Figure 2 shows both the SAA and WAA.

Summer Action Area

The SAA is based on a 1.5 miles buffer on either side of the proposed centerline, along the entire length of the proposed project. Additionally, the SAA has been expanded to include all areas where indirect development is forecasted contiguous with the SAA based on the induced growth expectations with TAZs (Traffic Analysis Zones).

Winter Action Area

The WAA is based on a 5-mile radius buffer around each of the caves where northern long-eared bat presence has been established through either I-69 specific cave studies or USFWS presence data. The 5-mile radius areas for each of 50 caves were combined together to form an overall WAA. Additionally, the WAA has been expanded to include all areas where indirect development are forecasted contiguous with the WAA based on the induced growth expectations in TAZs (Traffic Analysis Zones).

Northern Long-Eared Bat Critical Habitat

There is currently no Critical Habitat designated for the northern long-eared bat within its range. Therefore, no Critical Habitat for the northern long-eared bat exists within the Summer or WAAs for the I-69 project.

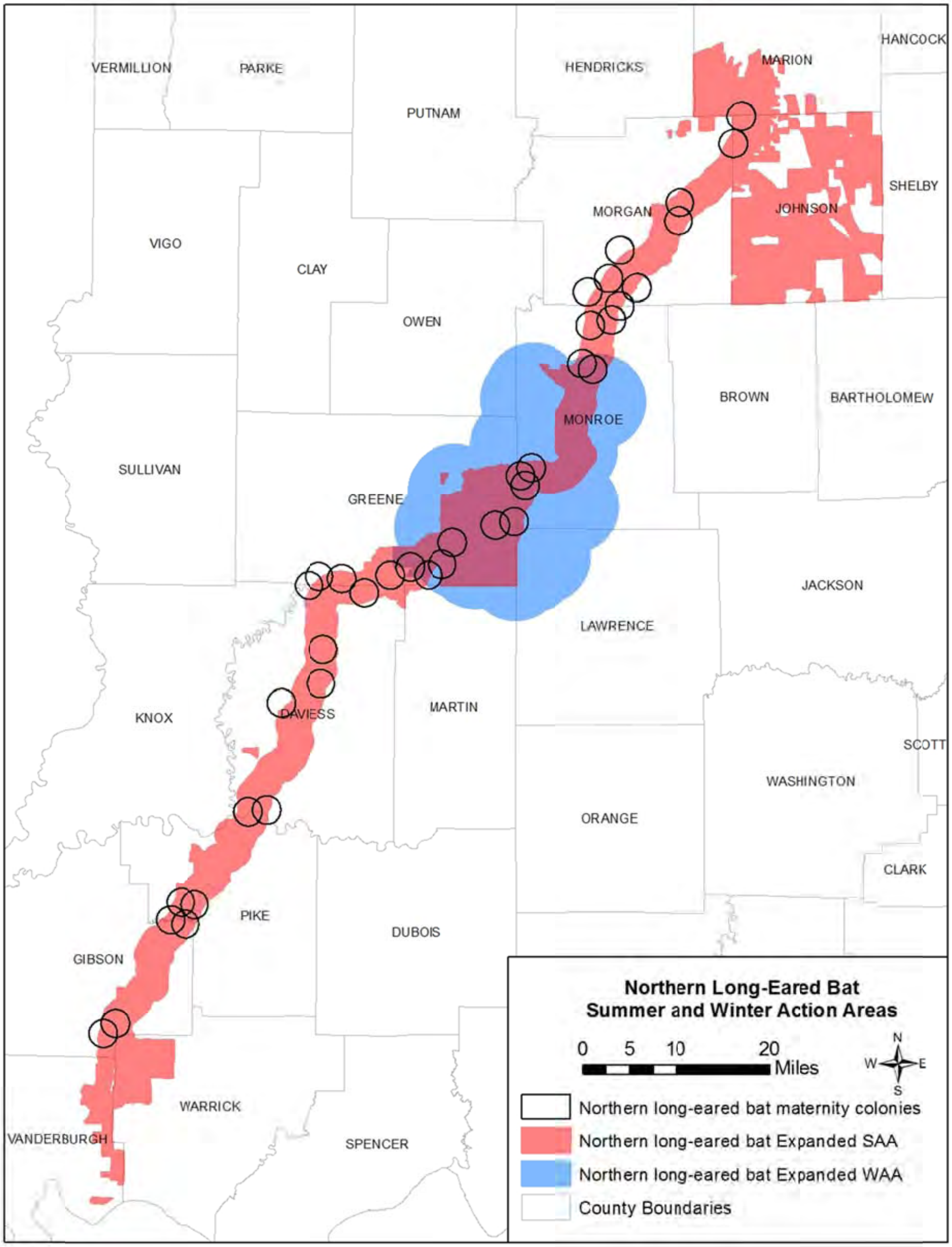

Figure 2: Northern long-eared bat Summer and Winter Actions Areas

Forest, Wetland and Stream Mitigation (Completed/Proposed)

This section of the Tier 1 BA Addendum for the northern long-eared bat details completed mitigation activities in 2004 through 2013 for both the Indiana bat and the northern long-eared bat. This summary describes parcels and discusses progress and approved and/or recommended mitigation credits. For Sections 1 through 5, forest impacts represent the non-wetland forest impacts identified in the Tier 2 BO; and water resource impacts represent the impacts in the Section 401/404 permit applications. Final impact and required mitigation numbers are still to be determined for Section 5. In an effort to protect the confidentiality of the mitigation site property owners, mitigation sites are referred to by a generic name instead of the owner name. The purpose of this list is to provide a descriptive and accurate account for Indiana bat/northern long-eared bat mitigation lands in each section of I-69, and establish a dialogue for determining mitigation credits applicable to the northern long-eared bat in completed and future activities and purchases.

Section 1

Table 3 provides a summary of mitigation acreages for Section 1.

Table 3: Summary of Section 1 Mitigation Acreages

Habitat Type	Impacts	Required Acreage	Acres Currently Secured (Credits)	Percent of Required Acres Secured[1]	Acres Still Needed
Forested Wetlands	0.02	2	2	100	None[2]
Emergent Wetlands	1.16	3	3	100	None[2]
Scrub/Shrub Wetlands	0	0	0	N/A	None
Aquatic Bed Wetlands	0	0	0	N/A	None
Open Water Wetlands[3]	0.75	0.75	0	N/A	0.8[3]
Upland Forest Reforestation	28	52.1	95.4	183	None
Upland Forest Preservation		31.9	31.9	100	None
Streams (linear feet)	15,573	18,270	18,270	100	None[2]

[1] Percentage is calculated by acres currently secured (credits) / required acreage.
[2] Includes contingency above required ratio.
[3] Open water wetlands mitigated “out of kind” using additional forested wetland acres.
Section 1 mitigation is contained within the Pigeon Creek site.

(1) **Pigeon Creek** – This property is located at the
in Gibson County. The property consists of high quality wetland, bottomland forest, and agricultural land. Pigeon Creek, the Besing lateral, and the Stunkel lateral (all legal drains) flow through the site. Indiana bats and northern long-eared bats have been found in the general area, and USFWS has determined 2 northern long-eared bat maternity colonies associated with Pigeon Creek (Exhibits 2 and 3). The proposed mitigation design will mitigate for all Section 1 stream, wetland, and forest impacts. Information pertaining to this site can be found in Appendix A of the 2013 Annual Report dated January 22, 2014, including the Tracking Property Report.

Mitigation Credit - Approximately 3 acres of emergent wetland development, 2 acres of forested wetland development, 95.4 acres of reforestation, 31.9 acres of forest preservation, and 18,270 linear feet of stream credits.

Status - The acquisition Categorical Exclusion (CE) was approved in 2007. A conservation easement was purchased in 2007. In 2008, the CE was approved for construction of this site. Construction was completed in 2009. The fifth year of annual monitoring was completed in 2013. INDOT requested the site be released from monitoring in 2013. INDOT is currently managing the property. Once the site has been determined to be successful, the current land owners are responsible for the long-term management of the property per the restrictive covenants which have been recorded on the property.

Northern Long-eared Bat Maternity Colonies - Two northern long-eared bat maternity colonies have been determined by USFWS. They are Pigeon Creek South and Pigeon Creek North. The mitigation site is within both maternity colonies. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

Section 2

Table 4 provides a summary of mitigation acreages for Section 2.

Table 4: Summary of Section 2 Mitigation Acreages

Habitat Type	Impacts	Required Acreage	Acres Currently Secured (Credits)	Percent of Required Acres Secured	Acres Still Needed
Forested Wetlands	10.33	30.99	65.25	211	None
Emergent Wetlands	4.98	9.96	10.8	108	None
Scrub/Shrub Wetlands	0.03	0.09	3.5	3,889	None
Aquatic Bed Wetlands[1]	0.72	1.44	0	N/A	1.4[1]
Open Water Wetlands[2]	3.83	3.83	0	N/A	3.8[2]
Upland Forest Reforestation	221	221	231	105	None
Upland Forest Preservation		442	453.4	103	None
Streams (linear feet)[3]	37,565	29,960	15,790	53	14,170[3]

[1] Aquatic bed wetlands mitigated “out of kind” using additional emergent wetland acres.
[2] Open water wetlands mitigated “out of kind” using additional scrub/shrub wetland acres.
[3] 7,950 linear feet mitigated on-site. Excess stream mitigation in Section 3 to be utilized for Section 2, as approved by IDEM and the USACE.
Section 2 secured mitigation sites: Patoka/Hurricane, Patoka-Oxbow, Patoka-Canal, Patoka-Dongola Bridges, Patoka-Logan, Patoka-South Fork, Flat Creek, Patoka-Meridian, Horseshoe, and Sandy Hook.

(2) **Patoka/Hurricane** – This property is located south of CR 150 North and is approximately two miles west of SR 57 in Gibson County near the Patoka River. It includes a portion of the old Patoka River channel (slough). The slough currently functions as an emergent wetland, and is included as part of the preservation acreage. The site consist of wetland/bottomland woods and agricultural land. National Wetland Inventory (NWI) mapped wetlands located within and in the vicinity of the site are primarily classified as forested with some emergent and scrub/shrub. This property is located across CR 150 North where two lactating female Indiana bats were captured in 1993. An Indiana bat roost tree was in 2004 in close proximity to this parcel. In addition, a number of northern long-eared bats were captured in this general area. This land is within the Refuge’s acquisition boundary. Information pertaining to this site can be found in Appendix B in the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit –Approximately 0.4 acre of emergent wetland development, 11.65 acres of forested wetland development, and 7.49 acres of forest preservation.

Status – The CE was approved in 2008. The site was purchased fee simple in 2008. Construction was completed in 2010. The fourth year of annual monitoring was completed in 2013. INDOT is the current owner and will be responsible for the short-term monitoring of this site. USFWS (Patoka River National Wildlife Refuge) is responsible for long-term management of this property. A bat habitat pole has been installed within the property limits. The design plan for this structure was reviewed by USFWS and was approved in 2009. However since that time, USFWS has requested that bat poles not be installed on subsequent mitigation sites.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within Robinson South and Patoka South Fork maternity colonies. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(3) **Patoka-Oxbow** – This property contains a primary Indiana bat roost and is within the Patoka River National Wildlife Refuge acquisition boundary. Information pertaining to this site can be found in Appendix B of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 2 acres of forest preservation.

Status – The site was purchased fee simple in 2006. The site was released from monitoring in 2006 by USFWS. USFWS owns this property and it is part of the Patoka River National Wildlife Refuge. USFWS is responsible for long-term management of this property. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within the Robinson South maternity colony. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(4) **<u>Patoka-Canal</u>** – This property is located in Gibson County. The site is entirely forested. It is surrounded on three sides by the South Fork of the Patoka River which flows into the Patoka River just downstream of the property. NWI mapped wetlands associated with the South Fork cover the majority of the property. Most of the property is located within the Patoka River floodplain and floods regularly. The site is within approximately one mile of a documented Indiana bat roost tree (2004) and is located approximately 0.4 mile from the Patoka River via a flyway along the South Fork. In addition, a number of northern long-eared bats were captured in this general area. The old Wabash-Erie Canal bed and former aqueduct site are located on the property. The tract includes some large hardwood timber. Information pertaining to this site can be found in Appendix C, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 15.6 acres of forest preservation.

Status – The site was purchased fee simple in 2009. The site was released from monitoring in 2009 by USFWS. USFWS owns this property and it is part of the Patoka River National Wildlife Refuge. USFWS is responsible for long-term management of this property. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within the Robinson South, Patoka South Fork and Robinson North maternity colonies, and near the Flat Creek maternity colony. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(5) **Patoka-Dongola Bridges** – This property is located along the in Gibson County . The site is mostly agricultural land which is subject to flooding. The Patoka River flows through the property and Houchins Drain marks the property's northern boundary. Indiana bats and northern long-eared bats have been captured in this general area. Information pertaining to this site can be found in Appendix C of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – This site involves Section 106 mitigation for visual impacts to the Patoka Bridges Historic District. Evergreen and bottomland forest plantings will be used to aid in visual screening per the MOA. No forest or wetland credits are proposed at this time.

Status – Environmental clearance for this site was included in the Section 2, Segments 1 and 1A reevaluation document. The site was purchased fee simple in 2010. Construction was completed in 2012.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within Robinson South, Patoka South Fork, and Robinson North maternity colonies, and near the Flat Creek maternity colony. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(6) **Patoka-Logan –** This property is located in Pike County. This area was a former strip mine and is currently upland fallow fields. I-69 is located within this property. Information pertaining to this site can be found in Appendix C of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 38.8 acres of reforestation and 22.4 acres of forest preservation.

Status – This site was purchased fee simple in 2004. Construction was completed in 2012. The second year of annual monitoring was completed in 2013. USFWS owns this property and it is part of the Patoka River National Wildlife Refuge. INDOT will be responsible for the short-term monitoring of this site. USFWS is responsible for long-term management of this property.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within Robinson South, Patoka South Fork, Robinson North and Flat Creek maternity colonies. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(7) **Patoka-South Fork** – This property is located in Gibson County. It includes primarily agricultural land with some bottomland woods and a buttonbush swamp. The large field has a deep ditch that drains some of the field with an existing emergent wetland protruding into the field from the western boundary. USFWS owns property north of this site as part of the Patoka River National Wildlife Refuge. This site is within the Refuge's acquisition boundary. The property floods in the spring from the Patoka River. In addition, an active coal mine permit boundary extends onto the southern portion of this property. However, review of the mine plan and coordination with the mine operator have identified that there are no plans for mining which will include the Patoka-South Fork property. I-69 is located within the corner of this property. Information pertaining to this site can be found in Appendix C of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 6.2 acres of emergent wetland development, 46.4 acres of forested wetland development, and 71.6 acres of forest preservation.

Status – The CE was approved in 2009. The property owner signed the deed transfer in 2009; however, the mining company did not relinquish the lease of the land until 2010 when INDOT purchased the property fee simple. Construction was completed in 2012. The second year of annual monitoring was completed in 2013. INDOT will be responsible for the short-term monitoring of this site. USFWS will be responsible for long-term management of this property.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within the Robinson South and Patoka South Fork maternity colonies, and near the Robinson North maternity colony. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(8) **Flat Creek** – This property is located in Pike County. It includes existing forests with some core forest. This property is within the Patoka River National Wildlife Refuge acquisition boundary and within core habitat for the copperbelly water snake. Flat Creek flows through the property and into the Patoka River which is south of the parcel. The Patoka River is impaired for poly-chlorinated biphenyls (PCBs) and Mercury (Hg) and is on the Natural Resources Commission (NRC) List of Outstanding Rivers for Indiana. Most of the site is within the 100-year floodplain and contains NWI mapped forested wetlands. Information pertaining to this site can be found in Appendix D of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 224.5 acres of forest preservation.

Status – The CE was approved in 2008. The site purchased fee simple in 2008. INDOT will be responsible for the short-term monitoring of this site. USFWS will be responsible for long-term management of this property. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is within the Patoka South Fork, Robinson North and Flat Creek maternity colonies. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(9) **<u>Patoka-Meridian</u>** – This property consists of two parcels located in Pike County. It is south of the Patoka River. The western tract is primarily swamp and forested while the eastern parcel is primarily forested. Information pertaining to this site can be found in Appendix D of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 4.2 acres of forest preservation.

Status – The site was purchased fee simple in 2008. The site was released from monitoring in 2008 by USFWS. USFWS owns this property and it is part of the Patoka River National Wildlife Refuge. USFWS is responsible for long-term management of this property. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - Four northern long-eared bat maternity colonies have been determined by USFWS in this area. They are Robinson South, Robinson North, Patoka South Fork and Flat Creek. The mitigation site is approximately 1 mile east of the Patoka South Fork maternity colony. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(10) **<u>Horseshoe</u>** – This property is located in Daviess County. The parcel includes a cutoff oxbow which provides a mosaic of open water, emergent wetland and scrub/shrub wetland habitat. is spring fed by three natural springs from the hillside to the north. The Indiana Department of Natural Resources (IDNR) found a rare orchid located not far from this mitigation site. The majority of the property has been disturbed through land clearing and agricultural practices, excluding the area known as which contains natural woods and wetlands. Land use adjacent to the mitigation site includes agricultural fields to the north, south, and west. The eastern boundary of the site is surrounded by existing bottomland and upland forests. Forested, scrub/shrub and emergent NWI wetlands are mapped within and adjacent to the site. Information pertaining to this site can be found in Appendix E of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 2.3 acres of emergent wetland development, 5.8 acres of forested wetland development, 101.8 acres of reforestation, 34 acres of forest preservation, and 7,550 linear feet of stream credits.

Status – The CE was approved in 2008. The site was purchased fee simple in 2009. Construction was completed in 2010. The fourth year of annual monitoring was completed in 2013. A bat habitat pole has been installed within the property limits. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - Two northern long-eared bat maternity colonies have been determined by USFWS in this area. They are East Fork White River and Aikman Creek. The mitigation site is near the Aikman Creek maternity colony. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

(11) <u>Sandy Hook</u> – This property is located in Pike County. It includes forests, fallow fields, and agricultural land. The property is within the Lower East Fork White River watershed and a portion of the site is located within the 100-year floodplain of the East Fork of the White River. The majority of the property has been disturbed through land clearing and agricultural practices. Land use adjacent to the mitigation site includes agricultural fields and woodlots to the west, east and south. The northern boundary of the site is the East Fork of the White River. Forested NWI mapped wetlands are located within and adjacent to the site. Information pertaining to this site can be found in Appendix E of the Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 1.9 acres of emergent wetland development, 1.4 acres of forested wetland development, 3.5 acres of scrub-shrub wetland development, 90.4 acres of reforestation, 71.6 acres of forest preservation, and 8,240 linear feet of stream credits.

Status – The Acquisition CE was approved in 2008. The site was purchased fee simple in 2008. The Construction CE was approved in 2009. Construction was completed in 2010. The fourth year of annual monitoring was completed in 2013. A bat habitat pole has been installed within the property limits. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - Two northern long-eared bat maternity colonies have been determined by USFWS in this area. They are East Fork White River and Aikman Creek. The mitigation site is within both of these maternity colonies. Purchasing this property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat. Exhibits 2 and 3 show the overlap of both species maternity colonies.

North of the East Fork before coming to the city of Washington, INDOT and FHWA have an additional mitigation site called Veale Creek. It is physically located in Section 2, but due to its late acquisition is credited for Section 4 mitigation. Below is a description of the Veale Creek mitigation site.

(12) **<u>Veale Creek</u>** – This property is located in Daviess County. This property is located in Section 2. This mitigation property includes two parcels; both parcels consist of forests, pasture fields, and agricultural land. Veale Creek flows through the parcel and is impaired for *E. coli*. The creek is associated with the 100-year floodplain and several mapped NWI forested wetlands. The entire property is within the Veale Creek-Lower Watershed. A roost tree is at the edge of this property. I-69 is located within this property. Information pertaining to this site can be found in Appendix G of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 4.21 acres of emergent wetland development, 7.36 acres of forested wetland development, 1.63 acres of scrub/shrub wetland development, 87.5 acres of reforestation, 40 acres of forest preservation, and 3,092 linear feet of stream credits.

Status – For parcel #1, the CE was approved in 2009. The site was purchased fee simple in 2009. Construction was completed in 2011. The second year of annual monitoring was completed in 2013. For parcel #2, the CE was approved in 2010. The site was purchased fee simple in 2010. Construction was completed in 2011. The second year of annual monitoring was also completed in 2013. INDOT is responsible for the short-term monitoring of these sites. INDOT will also be responsible for the long-term management of these mitigation sites until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - No northern long-eared bat maternity colonies have been determined by USFWS in this area. A male northern long-eared bat was caught near this mitigation site (Exhibit 3).

This area is primarily agricultural land with narrow riparian corridors and small woodlots. Exhibits 2 shows the Indiana bat Veale Creek maternity colony, but no northern long-eared bat maternity colony. With the proposed mitigation, habitat for the northern long-eared bat will be developed and of benefit to both species.

Section 3

In the heart of Section 3 is primarily agricultural land with drainage ditches/streams. These streams have little to no riparian forests along them and are managed by drainage boards; however, there are some woodlots of good size adjacent to them. One such example is Thousand Acre Woods which is owned and managed by The Nature Conservancy. It became a State Nature Preserve in 2001. Because of these larger woodlots, northern long-eared bat have been caught and it would not be unexpected to have Indiana bats in the future. Data from INDOT and FHWA show a small number of northern long-eared bats and no Indiana bats.

Since Thousand Acre Woods is protected by its owner (The Nature Conservancy) and IDNR (Nature Preserve), and since agricultural practices in this area promote agricultural activities and the managing of stream channels and banks free of trees, mitigation in this area for the northern long-eared bat is possibly limited. The three northern long-eared bat maternity colonies determined by USFWS for this area are Thousand Acre Woods, North Fork Prairie Creek and Smothers Creek. Table 5 provides a summary of mitigation acreages for Section 3.

Table 5: Summary of Section 3 Mitigation Acreages

Habitat Type	Impacts	Required Acreage	Acres Currently Secured (Credits)	Percent of Required Acres Secured	Acres Still Needed
Forested Wetlands	2.27	6.81	24.4	358	None
Emergent Wetlands	2.41	4.82	17.4	361	None
Scrub/Shrub Wetlands	0.63	1.89	7.2	381	None
Aquatic Bed Wetlands	0	0	0	N/A	None
Open Water Wetlands[1]	0.96	0.96	0	N/A	1[1]
Upland Forest Reforestation	67.5	124.7	194.4	156	None
Upland Forest Preservation		77.8	77.8	100	None
Streams (linear feet)[2]	16,690	12,265	36,132	295	None[2]

[1] Open water wetlands mitigated "out of kind" using additional forested wetland acres.
[2] Of 16,690 linear feet of stream impacts, 4,425 linear feet will be mitigated on-site (leaving 12,265 linear feet requiring mitigation). Excess stream mitigation in Section 3 to be utilized for Section 2, as approved by IDEM and the USACE.
Section 3 mitigation is contained within the Newberry site.

(13) __Newberry__ – This property is located in Greene County, It includes two tracts of riparian forests and agricultural land. The entire site is within the 100-year floodplain of the West Fork of the White River. The proposed mitigation design will mitigate for all of Section 3 stream, wetland, and forest impacts. Information pertaining to this site can be found in Appendix F of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report. This mitigation site has shown many northern long-eared bats and a constant number of Indiana bats from year to year.

> **Mitigation Credit –** Approximately 17.4 acres of emergent wetland development, 24.4 acres of forested wetland development, 7.2 acres of scrub/shrub development, 194.4 acres of reforestation, 77.8 acres of forest preservation, and 36,132 linear feet of stream credits.

Status – The CE was approved in 2008. The site was purchased fee simple in 2009. The remaining 27 acres may be used for future INDOT mitigation projects. Construction was completed in 2011. The fourth year of annual monitoring was completed in 2013. Two bat habitat poles were installed within the property limits and during mist netting, hundreds of bats were observed using these poles. INDOT is responsible for the short-term monitoring of this site. IDNR Division of Fish and Wildlife has agreed to be responsible for the long-term management of this mitigation site. Appendix F of the 2013 Annual Report dated January 22, 2014 includes various meeting minutes (with relevant portions highlighted) discussing IDNR's interest in managing this site long-term.

Northern Long-Eared Bat Maternity Colony - Two northern long-eared bat maternity colonies have been determined by USFWS in this area. They are the White River – Weaver Ditch and White River – Fourmile Creek. The mitigation site is within both maternity colonies. Purchasing this 355-acre property and completing mitigation is beneficial to both the Indiana bat and the northern long-eared bat, and its ultimate ownership by IDNR and protection, will help both species into the future. Exhibits 2 and 3 show the overlap of both species maternity colonies. Of all the northern long-eared bat capture sites, this area showed the most northern long-eared bat in the summer.

To the east of the West Fork – Weaver Ditch and West Fork – Fourmile Creek northern long-eared bat maternity colonies, there exists First Creek with its extensive bottomland forests. Northern long-eared bats and Indiana bats have been found along First Creek. No maternity colony for the Indiana bat has been developed here and the USFWS has developed two northern long-eared bat maternity colonies. They are First Creek West and First Creek East. Two mitigation sites are in this area. They are the West Fork and South Newberry. These two mitigation sites are physically located more in Section 3 than Section 4; however, were placed in Section 4 for mitigation credits. It is most important that the reader recognize the location of the West Fork mitigation site is upstream of the Newberry bridge where the Indiana bat roosts in Spring and Fall, and is in prime habitat for the northern long-eared bat as shown by their numbers along the West Fork of the White River near Newberry.

(14) **West Fork** – This property is located

in Greene County. This mitigation property includes bottomland field and forest. The site is adjacent to the West Fork of the White River and is almost entirely within the 100-year floodplain. There is a small intermittent stream that flows through the southern section of the property. A levee is located along the river portion with an abandoned railroad bed determining the property's eastern boundary. The property also includes open water, scrub/shrub, emergent and forested wetlands. A 40-acre Conservation Reserve Program (CRP) parcel exists within the property which was planted during the spring of 2010. The owner agreed to pay the penalty to remove this CRP and place it in the conservation easement. Information pertaining to this site can be found in Appendix H, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 4.3 acres of emergent wetland development, 28.7 acres of forested wetland development, 11.8 acres of scrub/shrub wetland development, 94.6 acres of reforestation, 25.6 acres of forest preservation, and 28,410 linear feet of stream credits.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - One northern long-eared bat maternity colony has been determined by USFWS in this area. It is at the edge of the First Creek West northern long-eared bat maternity colony. Purchasing this large property and completing mitigation is beneficial to both the Indiana bat and the northern long-ear. There is no overlap with an Indiana bat maternity colony, but is located approximately 1 mile upstream of the Newberry Bridge where many Indiana bats have been recorded and northern long-eared bats have been found throughout this general area.

(15) **South Newberry** – This property is located

in Greene County. This property includes forest and agricultural land. The property is within the First Creek drainage and is close to a large wetland adjoining a small lake. I-69 is located within this property. Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 23 acres of reforestation and 6.9 acres of forest preservation.

Status – The CE was approved in 2010. The site was purchased fee simple in 2011. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - One northern long-eared bat maternity colony has been determined by USFWS in this area. It is within the First Creek West northern long-eared bat maternity colony. Purchasing this 40 acres and completing mitigation is beneficial to both the Indiana bat and the northern long-ear. There is no overlap with an Indiana bat maternity colony.

Eastward to the end of Section 3 is the northern long-eared bat maternity colony Doan's Creek West. It has an excellent 230-acre mitigation site that has been constructed and planted.

(16) <u>Doan's Creek</u> – This 230-acre property includes multiple parcels of land located in Greene County. Although this property is outside the Indiana bat focus area, it is connected to the maternity colony via Doan's Creek and the West Fork of the White River and is in the middle or heart of the Doan's Creek West northern long-eared bat maternity colony. This property has bottomland forests (including some reforested areas) associated with Doan's and First Creeks. The site contains wet woods and fields, Doan's Creek and tributaries, two ponds, one large spring, and seeps. The property is contiguous with the Indiana Forestry Education Foundation property. I-69 is located within this property. The property also includes two acres of landlocked/excess land. Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 14.5 acres of forested wetland development, 47.5 acres of reforestation, 146.6 acres of forest preservation, and 1,335 linear feet of stream credits.

Status – The CE was approved in 2010. The site was purchased fee simple in 2011. The oil/gas lease area was excluded from plantings. Construction is estimated to begin in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - One northern long-eared bat maternity colony has been determined by USFWS in this area. It is within the Doan's Creek West northern long-eared bat maternity colony. Purchasing this 230-acre property and completing mitigation is beneficial to both the Indiana bat and the northern long-ear bat. There is no overlap with an Indiana bat maternity colony.

Section 4

Table 6 provides a summary of mitigation acreages for Section 4.

Table 6: Summary of Section 4 Mitigation Acreages

Habitat Type	Impacts	Required Acreage	Acres Currently Secured (Credits)	Percent of Required Acres Secured	Acres Still Needed
Forested Wetlands	2.36	7.25	64.96	896	None
Emergent Wetlands	4.9	9.8	20.41	208	None
Scrub/Shrub Wetlands	0.19	0.57	13.43	2,356	None
Aquatic Bed Wetlands	0	0	0	N/A	None
Open Water Wetlands[1]	1.97	1.97	0	N/A	2[1]
Upland Forest Reforestation	1,103	1,103	1,119.9	102	None
Upland Forest Preservation		2,206	2,957.8	134	none
Streams (linear feet)	88,462	88,462	110,707	125	None

[1] Open water wetlands mitigated "out of kind" using additional forested wetland acres.

(12) **Veale Creek** – This property is located in Daviess County. This property is located in Section 2. This mitigation property includes two parcels; both parcels consist of forests, pasture fields, and agricultural land. Veale Creek flows through the parcel and is impaired for *E. coli*. The creek is associated with the 100-year floodplain and several mapped NWI forested wetlands. The entire property is within the Veale Creek-Lower Watershed. A roost tree is at the edge of this property. I-69 is located within this property. Information pertaining to this site can be found in Appendix G of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 4.21 acres of emergent wetland development, 7.36 acres of forested wetland development, 1.63 acres of scrub/shrub wetland development, 87.5 acres of reforestation, 40 acres of forest preservation, and 3,092 linear feet of stream credits.

Status – For parcel #1, the CE was approved in 2009. The site was purchased fee simple in 2009. Construction was completed in 2011. The second year of annual monitoring was completed in 2013. For parcel #2, the CE was approved in 2010. The site was purchased fee simple in 2010. Construction was completed in 2011. The second year of annual monitoring was also completed in 2013. INDOT is responsible for the short-term monitoring of these sites. INDOT will also be responsible for the long-term management of these mitigation sites until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - No northern long-eared bat maternity colonies have been determined by USFWS in this area. A male northern long-eared bat was caught near this mitigation site (Exhibit 3). This area is primarily agricultural land with narrow riparian corridors and small woodlots. Exhibit 2 shows the Indiana bat Veale Creek maternity colony, but no northern long-eared bat maternity colony. With the proposed mitigation, habitat for the northern long-eared bat will be developed and of benefit to both species.

(14) **West Fork** – This property is located in Greene County. This mitigation property includes bottomland field and forest. The site is adjacent to the West Fork of the White River and is almost entirely within the 100-year floodplain. There is a small intermittent stream that flows through the southern section of the property. A levee is located along the river portion with an abandoned railroad bed determining the property's eastern boundary. The property also includes open water, scrub/shrub, emergent and forested wetlands. A 40-acre Conservation Reserve Program (CRP) parcel exists within the property which was planted during the spring of 2010. The owner agreed to pay the penalty to remove this CRP and place it in the conservation easement. Information pertaining to this site can be found in Appendix H, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 4.3 acres of emergent wetland development, 28.7 acres of forested wetland development, 11.8 acres of scrub/shrub wetland development, 94.6 acres of reforestation, 25.6 acres of forest preservation, and 28,410 linear feet of stream credits.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - One northern long-eared bat maternity colony has been determined by USFWS in this area. It is at the edge of the First Creek West northern long-eared bat maternity colony. Purchasing this large property and completing mitigation is beneficial to both the Indiana bat and the northern long-ear bat. There is no overlap with an Indiana bat maternity colony, but is located approximately 1 mile upstream of the Newberry Bridge where many Indiana bats have been recorded and northern long-eared bats have been found in the general area.

(15) <u>South Newberry</u> – This property is located

in Greene County. This property includes forest and agricultural land. The property is within the First Creek drainage and is close to a large wetland adjoining a small lake. I-69 is located within this property. Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 23 acres of reforestation and 6.9 acres of forest preservation.

Status – The CE was approved in 2010. The site was purchased fee simple in 2011. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - One northern long-eared bat maternity colony has been determined by USFWS in this area. It is within the First Creek West northern long-eared bat maternity colony. Purchasing this 40-acre property and completing mitigation is beneficial to both the Indiana bat and the northern long-ear. There is no overlap with an Indiana bat maternity colony.

(16) <u>Doan's Creek</u> – This 230-acre property includes multiple parcels of land located in Greene County. Although this property is outside the Indiana bat focus area, it is connected to the maternity colony via Doan's Creek and the West Fork of the White River and is in the middle or heart of the Doan's Creek West northern long-eared bat maternity colony. This property has bottomland forests (including some reforested areas) associated with Doan's and First Creeks. The site contains wet woods and fields, Doan's Creek and tributaries, two ponds, one large spring, and seeps. The property is contiguous with the Indiana Forestry Education Foundation property. I-69 is located within this property. The property also includes two acres of landlocked/excess land. Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 14.5 acres of forested wetland development, 47.5 acres of reforestation, 146.6 acres of forest preservation, and 1,335 linear feet of stream credits.

Status – The CE was approved in 2010. The site was purchased fee simple in 2011. The oil/gas lease area was excluded from plantings. Construction is estimated to begin in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - One northern long-eared bat maternity colony has been determined by USFWS in this area. It is within the Doan's Creek West northern long-eared bat maternity colony. Purchasing this 230-acre property and completing mitigation is beneficial to both the Indiana bat and the northern long-ear. There is no overlap with an Indiana bat maternity colony.

(17) <u>Crane</u> – This property includes two separate parcels. Parcel #1 is located in Greene County . Parcel #2 is located in Martin County. Both parcels contain wooded areas with shagbark hickories and an agricultural field. Doan's Creek and many other ephemeral streams flow through the northern property. Both parcels skirt the Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 55.7 acres of reforestation and 30.2 acres of forest preservation.

Status – The CE was approved in 2010. The site was purchased fee simple in 2012. Construction began in 2013 and is anticipated to be completed in 2014. INDOT is responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of these mitigation sites until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - It is at the edge of 3 northern long-eared bat maternity colonies. They are Doan's Creek West, Doan's Creek East and Bogard Creek. The mitigation site is near the Bogard Creek maternity colony. Exhibit 2 shows the overlap of maternity colonies for each species. With this mitigation, habitat for the northern long-eared bat will be developed and of benefit to both species.

(18) <u>Scotland</u> – This property is located in Greene County. This property includes a forested area, Doan’s Creek and ephemeral streams. This forested area has larger sized timber with many shagbark hickories. The terrain is steep in some areas, especially along Doan's Creek and limestone juts out from some of the steep slopes. This parcel is near the . Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 14 acres of forest preservation.

Status – The site was purchased fee simple in 2012. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site until an appropriate managing party is identified. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - It is at the edge of 3 northern long-eared bat maternity colonies. They are Doan’s Creek West, Doan’s Creek East and Bogard Creek. The mitigation site is near the Bogard Creek maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and of benefit to both species.

(19) <u>Dowden Ridge</u> – This property is located in Greene County. This parcel represents an excess or landlocked parcel purchased during the right-of-way acquisition and will be utilized for mitigation. Land use consists of forested and agricultural. There has been some logging along Dowden Branch, a large intermittent stream, and three UNTs of Dowden Branch flow through the mitigation site. This site is adjacent to mature forests, so preservation/reforestation of this site will provide additional core forest habitat. Information pertaining to this site can be found in Appendix H of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 41.1 acres of reforestation and 15.2 acres of forest preservation.

Status – The site was already purchased fee simple in 2011. The CE was approved on April 30, 2013. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - The mitigation site is located within 2 northern long-eared bat maternity colonies. They are Doan's Creek West and Bogard Creek. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and of benefit to both species.

(20) <u>Taylor Ridge</u> – This property is located

. This site includes forest and agricultural land. A unique rocky outcrop with waterfall, alcove and stream are located on this property. Information pertaining to this site can be found in Appendix H of the 2013 Annual Report, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 9.3 acres of emergent wetland development, 61.1 acres of reforestation, 178.7 acres of forest preservation, and 1,760 linear feet of stream credits.

Status – The CE was approved in 2010. The site received closure from IDEM in 2011 (the property was a hog farm in the past and operations ceased in 2003). The site was purchased fee simple in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the northern long-eared bat Black Ankle Creek and Doan's Creek East maternity colonies. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(21) **__Black Ankle__** – This property is in Greene County. This property consists of upland/bottomland forest and fields. is located directly east of this site and provides water to Black Ankle Creek and the surrounding lowland areas. I-69 is located within this property. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

> **Mitigation Credit** – Approximately 95.7 acres of reforestation, 143.3 acres of forest preservation, and 9,880 linear feet of stream credits.

> **Status** – The CE was approved in 2010. The site was purchased fee simple in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

> **Northern Long-Eared Bat Maternity Colony** - This mitigation site is located within Black Ankle Creek and Plummer Creek northern long-eared bat maternity colonies. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(22) **__Cooper Cemetery__** – This property is located in Greene County. This property includes upland and bottomland forests with many snags, wetlands and streams. The bottomland forest has been flooded by beaver activity. Wooded areas are in "Classified Forest." I-69 is located within this property. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

> **Mitigation Credit** – Approximately 245 acres of forest preservation.

> **Status** – The site was purchased fee simple in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the

state Programmatic CE. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Plummer Creek and Black Ankle northern long-eared bat maternity colonies. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved for both species to benefit.

(23) **<u>Cooper Lane</u>** – This property is located

in Greene County. The property includes upland forest, streams, and a karst spring. It is contiguous with other forested I-69 wooded tracts and near Martin State Forest. I-69 is located within this property. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 45 acres of forest preservation. .

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Plummer Creek northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved for both species to benefit.

(24) **<u>Hard Scrabble Ridge</u>** – This property is located

in Greene County. This mitigation property includes upland forest and ephemeral streams. The property is contiguous with other forested I-69 wooded tracts and Martin State Forest. I-69 is located within this property. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 57 acres of forest preservation.

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Plummer Creek northern long-eared bat maternity colony and near the Black Ankle Creek maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved for both species to benefit.

(25) **<u>Koleen</u>** – This property is located

in Greene County. The site consists of forests, fallow fields, and agricultural land. It is near other forested I-69 wooded tracts and Martin State Forest. is close to these properties and the site is close to . Information pertaining to this site can be found in Appendix I of the 2013 Annual Report, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 33.3 acres of reforestation, 27.1 acres of forest preservation, and 5,450 linear feet of stream credits.

Status – The CE was approved in 2010. The conservation easement was purchased in 2010. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Plummer Creek northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(26) Plummer Creek 1 – This property is located in Greene County. The property includes two parcels of forests, farmland, and streams (including Plummer Creek). This property includes a roost tree associated with a female Indiana bat captured in 2004; it is also adjacent to the property where this female Indiana bat was mist netted along Clyfty Creek. The bottomland forested wetlands are slough-like (possibly older oxbows from the original streambed of Plummer Creek). It is contiguous with other forested I-69 wooded tracts and adjacent to Martin State Forest. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 109 acres of reforestation, 112 acres of forest preservation, and 1,692 linear feet of stream credits.

Status – For parcel #1, the CE was approved in 2010. The conservation easement was purchased in 2011. For parcel #2, an Additional Information (AI) letter was approved in 2011. The site was purchased fee simple in 2012. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of these sites. The property owner will be responsible for the long-term management of these mitigation sites.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located near the Plummer Creek northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(27) <u>Plummer Creek 2</u> – This property is located in Greene County. This mitigation property includes two parcels; parcel #1 consists of bottomland wetlands, fields, streams, and forests while parcel #2 consists of upland forests and agricultural fields. Plummer Creek flows through the property; the creek is flashy and floods often causing for severe erosion of its stream banks. Similarly, beavers have diverted water onto this property which provides additional water to the existing constructed wetlands. There is an existing emergent and shallow open water wetland which was constructed under the USFWS Partners for Wildlife Funds. There are a large number of snags on this property and it is contiguous with other forested I-69 wooded tracts and Martin State Forest. A developing blue heron rookery is located west of the property. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 2.6 acres of emergent wetland development, 4 acres of forested wetland development, 24.5 acres of reforestation, 157.6 acres of forest preservation, and 7,485 linear feet of stream credits.

Status – For both parcels, the CE was approved in 2010. The conservation easement was purchased in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of these sites. The property owners will be responsible for the long-term management of these mitigation sites.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Plummer Creek northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(28) <u>SR 45</u> – This property is located in Greene County. This property contains mature upland and bottomland forest with many ephemeral streams. and a confirmed Indiana bat roost tree is located approximately 0.3 mile west of the mitigation area. I-69 is located within this property. Information pertaining to this site can be found in Appendix I of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 179 acres of forest preservation.

Status – The site was purchased fee simple in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Mitchell Branch northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved for both species to benefit.

(29) <u>Mitchell Branch West</u> – This property is located in Greene County. This parcel represents an excess or landlocked parcel purchased during the right-of-way acquisition and will be utilized for mitigation. Land use consists of woodland and fallow fields. The wooded portion is typical of a southwest Indiana hardwood forest. An UNT to Mitchell Branch flows through the property. Information pertaining to this site can be found in Appendix M of the 2013 Annual Report dated January 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 13 acres of reforestation and 77 acres of forest preservation.

Status – The site was already purchased fee simple in 2011. The CE was approved in 2012. Construction began in 2013 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Mitchell Branch northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(30) <u>Mitchell Branch</u> – This property is located in Greene County. This parcel represents an excess or landlocked parcel purchased during the right-of-way acquisition and will be utilized for mitigation. Land use consists of woodland habitat and fallow fields. The wooded portion is typical of a southwest Indiana hardwood forest. Mitchell Branch flows through the northern portion of the site and an UNT to Mitchell Branch flows west to east along the northern boundary of the site. Information pertaining to this site can be found in Appendix M, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 15.8 acres of reforestation, 22 acres of forest preservation, and 3,250 linear feet of stream credits.

Status – The site was already purchased fee simple in 2011. The CE was approved in 2012. Construction began in 2013 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Mitchell Branch northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(31) <u>Mitchell Branch East</u> – This property is located in Greene County. This parcel represents an excess or landlocked parcel purchased during the right-of-way acquisition and will be utilized for mitigation. Approximately 14 acres of woodland habitat will remain north of the highway. This property is typical of a southwest Indiana hardwood forest. Mitchell Branch flows through the southwestern portion of the site. Information pertaining to this site can be found in Appendix M of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 14 acres of forest preservation.

Status – The site was already purchased fee simple in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Mitchell Branch northern long-eared bat maternity colony and near the Little Indian Creek Monroe maternity colony. Exhibit 2 shows the overlap of maternity colonies for both the Indiana bat and the northern long-eared bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(32) <u>Indian Creek 1</u> – This property is located in Greene County . The property consists of forests, agricultural fields, and fallow fields. Indian Creek, four UNTs to Indian Creek, and an UNT to Mitchell Branch are located within the site boundaries. Forested wetlands are located within the project area and a portion of the site is within the 100-year floodplain of Indian Creek. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 7.6 acres of forested wetland development, 74.9 acres of reforestation, 51.6 acres of forest preservation, and 21,394 linear feet of stream credits.

Status – The CE was approved in 2011. The conservation easement was purchased in 2012 for the bottomland portion of this site. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site. The site was purchased fee simple in 2012 for the upland portion of this site. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified. Construction began in 2013 and is anticipated to be completed in 2014.

Northern Long-Eared Bat Maternity Colony - This mitigation site is located within the Little Indian Creek Monroe and Mitchell Branch northern long-eared bat maternity colonies. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the location of the mitigation site at the edge of the Indiana bat maternity colony. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(33) <u>Indian Creek 2</u> – This property is comprised of two parcels located in Greene County. Parcel #1 is located west and south of Indian Creek (western mitigation area). Parcel #2 is located east of Indian Creek (eastern mitigation area). This site includes bottomland, riparian, and upland forests. There are multiple snags within the woods and a small spring fed tributary is within the preservation area. I-69 is adjacent to this property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 1.1 acres of reforestation, 32.7 acres of forest preservation, and 1,180 linear feet of stream credits.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is near the edge of the Indian Creek South northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(34) **<u>Indian West</u>** – This property is located in Greene County. It is adjacent to other forested I-69 wooded tracts. The property is a wooded tract with Indian Creek flowing through the property. Per the adjacent property owner, bats are present along Indian Creek in large numbers. Beaver activity is common along this stretch of the stream and snags are also common on the property. I-69 is adjacent to this property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 58 acres of forest preservation.

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is near the Indian Creek South northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved for both species to benefit.

(35) **<u>Indian East</u>** – This property is located along in Greene County. The site is a wooded tract with Indian Creek flowing through the property. Per the property owner, bats are present along Indian Creek in large numbers. Beaver activity is common along this stretch of the stream and snags are also common on the property. The property is hilly with rocky ravines and what appears to be some karst features. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 40 acres of forest preservation.

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is near the Indian Creek South northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved for both species to benefit.

(36) <u>Indian Creek 3</u> – This property is located near the Greene and Monroe County line. The property includes bottomland/upland forests and bottomland/upland fields. Indian Creek flows through the property. is also located on the property; however, no land disturbance will occur within 100 feet of the cemetery boundaries. I-69 is located within this property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 2.8 acres of forested wetland development, 21.55 acres of reforestation, and 133.9 acres of forest preservation.

Status – The CE was approved in 2011. The site was purchased fee simple in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Indian Creek South and Indian Creek West northern long-eared bat maternity colonies. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the

Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(37) **<u>Indian Creek 5</u>** – This property is located in Monroe County. This parcel represents an excess or landlocked parcel purchased during the right-of-way acquisition and will be utilized for mitigation. Land use consists of forested and agricultural. Indian Creek as well as its 100-year floodplain and an UNT to Indian Creek are present within the site. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 37.9 acres of reforestation and 50.8 acres of forest preservation.

Status – The site was already purchased fee simple in 2012. The CE was approved on April 30, 2013. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Indian Creek South and Indian Creek West northern long-eared bat maternity colonies, and near the Indian Creek North maternity colony. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(38) **<u>Indian Creek 4</u>** – This property is located a in Monroe County. This property contains a variety of habitats including Indian Creek, upland/bottomland woods, upland pasture, streams, wetlands, and karst features. A recorded Indiana bat roost tree in 2004 is located close to the property. A former quarry is present and contains resources that have yet to be extracted (per property owner). I-69 is located within this property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 59 acres of reforestation, 73.7 acres of forest preservation, and 7,145 linear feet of stream credits.

Status – The CE was approved in 2011. The site was purchased fee simple in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Indian Creek South, Indian Creek West and Indian Creek North northern long-eared bat maternity colonies. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(39) **<u>Rock East Road</u>** – This property is located in Monroe County. The property includes forests, streams, springs, and caves. had an Indiana bat in 2004. The other caves are It is also within one mile of a maternity roost tree for the Indiana bat. Indian Creek also flows through the property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 7.8 acres of reforestation and 72.4 acres of forest preservation.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Indian Creek South northern long-eared bat maternity colony. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

(40) <u>Evans Lane</u> – This property is located

in Monroe County. This parcel represents an excess or landlocked parcel purchased during the right-of-way acquisition and will be utilized for mitigation. Land use consists of forest, agricultural and residential. The residential buildings will be removed as part of the I-69 construction. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 50.6 acres of reforestation and 28.5 acres of forest preservation.

Status – The site was already purchased fee simple in 2012. The CE was approved on April 30, 2013. Construction began in 2013 and is anticipated to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within 3 northern long-eared bat maternity colonies. They are Indian Creek South, Indiana Creek West and Indian Creek North. Exhibit 2 shows the overlap of maternity colonies for the northern long-eared bat and the Indiana bat. With this mitigation, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit.

The following mitigation sites were primarily associated with the Section 4 WAA mitigation.

(41) <u>Newark</u> – This property is located

in Greene County. This site contains forests, a lake, small pond, ephemeral streams, springs, rocky outcrops, and This cave had 812 Indiana bats in January 2009. Nonetheless, it has been recognized as an “ecological trap” and it is suggested if this property is purchased, a Conservation Management Plan be developed for this species. Information pertaining to this site can be found in Appendix K of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 73 acres of forest preservation.

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important since it will protect which is a known hibernacula for the northern long-eared bat and Indiana bat. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(42) <u>Beech Creek</u> – This property is located in Greene County. The property includes forests, Beech Creek, streams, large spring, and large field. Although this property is outside the focus area, it is hydrologically connected to . Information pertaining to this site can be found in Appendix K of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 33.6 acres of reforestation, 34.7 acres of forest preservation, and 6,945 linear feet of stream credits.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction began in 2012 and is expected to be completed in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important since Beech Creek flows through it and provides habitat for the northern long-eared bat and the Indiana bat. which is one of the largest hibernacula for the Indiana bat and other bats, including the northern long-eared bat. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(43) **<u>Gardner Road</u>** – This property is located in Monroe County. This property is primarily upland forest. The property has with a number of springs and a small creek. The property is adjacent to other forested I-69 wooded tracts and Sycamore Land Trust property. Information pertaining to this site can be found in Appendix L of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 18.2 acres of reforestation and 45.8 acres of forest preservation.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction was completed in 2012. The first year of annual monitoring was completed in 2013. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect and buffer . Both of these caves are and have many northern long-eared bats. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protecting many karst features and groundwater.

(44) <u>Richland Cemetery</u> – This property is located

in Monroe County. Richland Creek flows through the site. The property is "Classified Forest" and is within the vicinity of the Keisler Forest Legacy, Sycamore Land Trust, and other forested I-69 wooded tracts. Information pertaining to this site can be found in Appendix L of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 134 acres of forest preservation.

Status – The site was purchased fee simple in 2010. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site until an appropriate managing party is identified. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects and buffers

Both of these caves are

and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(45) <u>Coon Hollow</u> – This property is located

in Monroe County. This property includes mature forest, ravines, and springs.

are present within the site. These caves are managed by the Indiana Karst Conservancy (IKC). This site is contiguous with other forested I-69 wooded tracts. Information pertaining to this site can be found in Appendix L of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 440 acres of forest preservation. During a meeting in 2010, it was confirmed by USFWS that if INDOT paid over the fair market value for this property, USFWS will accept additional mitigation acres credit proportional to the excess amount paid for the property (not to exceed 50% which is 440 acres of credits).

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony – This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects Both of these caves are and have many northern long-eared bats. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(46) **<u>Gardner South</u>** – This property is located in Monroe County. The property includes upland forest, snags, sinkholes, and springs, and Tiparillo Hole. This property is in the vicinity of other forested I-69 wooded tracts. Information pertaining to this site can be found in Appendix L of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 12 acres of forest preservation.

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect and buffer Both of these caves are and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(47) <u>Garrison Chapel</u> – This property is located in Monroe County. The site includes mature forest and Salamander Cave. The property is contiguous with other forested I-69 wooded tracts and Sycamore Land Trust. Information pertaining to this site can be found in Appendix L of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 15 acres of forest preservation.

Status – The conservation easement was purchased in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects The latter two caves are and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(48) <u>Eller</u> – This property is located in Monroe County. The property includes forest, small stream, large spring, and The entrance to this cave was blocked in 1976 with large rocks. This property is close to

Information pertaining to this site can be found in Appendix L of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 61.8 acres of reforestation, 26.6 acres of forest preservation, and 5,595 linear feet of stream credits.

Status – The CE was approved in 2010. The conservation easement was purchased in 2011. Construction was completed in 2012. The first year of annual monitoring was completed in 2013. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony – This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects and potentially will lower its temperature inside to harbor more Indiana bats and northern long-eared bats. It is also very near and possibly connected to which is a known hibernacula for the Indian bat. is a known northern long-eared bat hibernacula. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(49) <u>Tramway</u> – This property is located in Monroe County. This forested tract is located immediately west of one other forested I-69 wooded tract. The site has several sinkholes and streams and is close to According to the property owner, many bats have been seen in the area. I-69 is located adjacent to this property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 22 acres of forest preservation.

Status – The conservation easement was purchased in 2012. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. The property owner will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from many hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(50) **<u>Clear Creek</u>** – This property is comprised of two parcels southwest of Bloomington in Monroe County. Parcel #1 is . Parcel #2 is . Both parcels contain grazing and forested habitats. Although the property is outside the focus area, it is close to (both hibernacula for the northern long-eared bat) and to a mist net site location where an Indiana bat and northern long-eared bats were captured in 2004. A small stream flows through the property and there is a small quarry present. is also located on the mitigation property. I-69 is located within this property. Information pertaining to this site can be found in Appendix J of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 51.6 acres of reforestation, 77.9 acres of forest preservation, and 6,094 linear feet of stream credits.

Status – The CE was approved in 2011. The conservation easement was purchased in 2012. Construction was completed in 2013. The first year of annual monitoring is expected to begin in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from many hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

Section 5

Table 7 provides a summary of mitigation acreages for Section 5.

Table 7: Summary of Section 5 Mitigation Acreages

Habitat Type	Impacts	Required Acreage	Acres Currently Secured[3] (Credits)	Percent of Required Acres Secured[3]	Acres Still Needed[3]
Forested Wetlands	1.43	4.29	5.4	126	0
Emergent Wetlands	2.65	5.3	0.9	17	4.4
Scrub/Shrub Wetlands	0.28	0.84	1.3	155	0
Aquatic Bed Wetlands[1]	0.08	0.16	0	N/A	0.16[1]
Open Water Wetlands[2]	0.02	0.02	0	N/A	0.02[2]
Upland Forest Reforestation	297[4]	297[4]	72.5	24	224.5[4]
Upland Forest Preservation		594[4]	602.1	101	0
Streams (linear feet)	42,220[5]	16,201	8,174	50	8,027

[1] Aquatic bed wetlands will be mitigated "out of kind" using additional emergent wetland acres.
[2] Open water will be mitigated "out of kind" using open-water or emergent wetland acres.
[3] Acquisition in Section 5 is currently ongoing and the above numbers are estimates.
[4] Impact and required mitigation is expected to be lower than presented due to reduction in proposed roadway, utility and billboard impacts.
[5] Of this total, 26,019 linear feet of existing culvert and captured roadside channels are proposed to be self-mitigating in future right-of-way.

Section 5 secured mitigation sites are Big Bend, Bryant Creek, Canyon, Chambers Pike, Griffith, Kinser Pike, Little Indian Creek, Principal, Ravinia Woods, Stout Creek, Victor Pike, Whisnand, Wylie and Union. **In addition,** Beanblossom Creek, Berean Valley, Cooksey Lane, Creek Road, Long Pond, Modesto, Nutter Ditch, Paragon, Richland Creek, Stout Valley and Waverly Bog are currently being pursued in order to fulfill mitigation requirements.

The above numbers include mitigation status in Section 5 as of July 7[h], 2014.

(51) Victor Pike – This property is located in Monroe County. There are two old railroad beds on the property. PCBs and creosote have been found in Clear Creek sediments and invasive plants (canary reed grass and Japanese Knotweed) are found in small patches on this property. The site is within the East

Fork of White River Watershed. It is not within an assigned Focus Area for Section 5 and is within the upper area of Section 4. Information pertaining to this site can be found in Appendix T of the 2013 Annual Report dated January 22, 2004, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 28.1 acres of reforestation, 19.2 acres of forest preservation, and 4,158 linear feet of stream credits

Status – The CE was approved on September 26, 2013. The property owner is requesting a fee simple purchase. An offer was made to the property owner in 2013. The offer has been accepted. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from many hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(52) <u>Richland Creek</u> – This property is located

in Greene County). The site is within Section 4; however, it is within the same 8-digit watershed as Section 5. The property consists of agricultural and riparian habitat. Richland Creek and one UNT of Richland Creek flow through the property. There is a recently dug pond/wetland in the northern half of the property which attracts many waterfowl.

Information pertaining to this site can be found in Appendix T of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 5,755 linear feet of stream credits. Coordination with the USFWS has determined this site will only be used for water resource-related mitigation.

Status – The property owner is requesting a fee simple purchase. The CE is anticipated to be approved in 2014.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from some very important hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(53) **<u>Stout Creek</u>** – This property is located

It is situated

it is primarily a mature forest which contains Stout Creek. A portion of this property is located within a defined 100-year floodplain. The site is within the Lower White River Watershed. The site could be considered a buffer between I-69 and this Historic District. Information pertaining to this site can be found in Appendix S of the 2013 Annual Report dated January 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 16 acres of forest preservation.

Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is south of two northern long-eared bat maternity colonies. They are the Beanblossom West and the Beanblossom East. This mitigation site protects habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. With this mitigation site, habitat for the northern long-eared bat has been preserved for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(54) <u>Stout Valley</u> – This property is located in Monroe County. The property consists of a large forest with Stout Creek flowing through the center of the property. Some of the observed tree species include northern red oak, green ash, white oak, sugar maple, black cherry, red cedar, and sweet gum. The forest tract includes a mixture of young and mature forest and is in the middle of two other Section 5 mitigation sites. Several state-listed species have been recorded near the site. Several springs have also been mapped on the site. Information pertaining to this site can be found in Appendix S of the Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 33 acres of forest preservation.

Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is near the Beanblossom East northern long-eared bat maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. With this mitigation site, habitat for the northern long-eared bat has been preserved for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

(55) Kinser Pike – This property is located . It is situated It is primarily a mature forest which contains Stout Creek. An old field is currently developing with scattered red cedars, dogwood, and autumn olive. A portion of this property is located within a defined 100-year floodplain. The site is within the Lower White River Watershed. The site could be considered a buffer between I-69 and this Historic District. Information pertaining to this site can be found in Appendix S of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 8.6 acres of reforestation and 34.6 acres of forest preservation.

Status – The CE was approved on September 13, 2013. The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is near the edge of two northern long-eared bat maternity colonies. They are the Beanblossom West and the Beanblossom East. This mitigation site protects habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. With this mitigation site, habitat for the northern long-eared bat has been preserved for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(56) Whisnand – This property is located in Monroe County. The majority of the property is mowed fallow fields with many sinkholes and forest. Block forest preservation is possible and will increase core forest. A small portion is within a defined 100-year floodplain. An eagle nest is located on the adjacent property. This site is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 24 acres of reforestation, 53.6 acres of forest preservation, and 695 linear feet of stream credits.

Status – The CE was approved on October 17, 2013. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Beanblossom West and the Beanblossom East northern long-eared bat maternity colonies. This mitigation site protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

(57) <u>Beanblossom Creek</u> – This property is located in Monroe County. The property contains upland and bottomland woods. Beanblossom Creek flows through the property. A portion of the property is located within a defined 100-year floodplain. A bald eagle nest is located on the east property. The site is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 36 acres of forest preservation.

Status – The CE was approved on September 13, 2013. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony – This mitigation site is within the Beanblossom West and the Beanblossom East northern long-eared bat maternity colonies. This mitigation site protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

(58) <u>Long Pond</u> – This property is located in Monroe County. It primarily consists of fallow fields and bottomland forests. Wetland woods and emergent wetlands are common within this property along with the excavated long pond. The site is located within the defined 100-year floodplain of Beanblossom Creek. The fields are currently in the CRP Program. The property is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2004, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 5.9 acres of emergent wetland development, 14.6 acres of forested wetland development, 2.9 acres of reforestation, and 85.8 acres of forest preservation.

Status – The CE was approved on September 13, 2013. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Beanblossom West and the Beanblossom East northern long-eared bat maternity colonies. This mitigation site protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat.

(59) <u>Griffith</u> – This property is in Monroe County. It is located between a proposed frontage road and I-69 alignment. The property includes forest and steep slopes and is adjacent to another I-69 mitigation site. As such, the property provides opportunities for block forest preservation and an increase in core forest habitat. This property is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 7 acres of forest preservation.

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Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Beanblossom West and Beanblossom East northern long-eared bat maternity colonies. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(60) <u>Modesto</u> – This property is located in Monroe County. The site includes upland forest and agricultural fields. It has a number of karst features with a nice stream flowing through it. A small portion of this property is within a defined 100-year floodplain. The site is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 1.3 acres of forested wetland development, 25.9 acres of reforestation, 119.3 acres of forest preservation, and 4,012 linear feet of stream credits.

Status – The CE was approved on September 13, 2013. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Beanblossom West and Beanblossom East northern long-eared bat maternity colonies. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(61) <u>Wylie</u> – This property is located . The driveway fronts SR 37 and the house/structures are within the proposed I-69 right-of-way. The property is adjacent to other potential I-69 mitigation sites. As such, the property provides an opportunity for block forest preservation and an increase in core forest habitat. There are larger sized shagbark hickories within the site. There is also a pond where the current owners have observed many bats. A small stream flows through property. The property is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 2 acres of reforestation and 14.8 acres of forest preservation.

Status – The CE was approved on September 13, 2013. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Beanblossom West and the Beanblossom East northern long-eared bat maternity colonies. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

(62) <u>Canyon</u> – This property is located

The property is highly dissected, and it is primarily forested with a mature forest containing several tree species and steep (rocky) slopes. A clear riffle and pool stream is located on this property; however, there are signs of erosion on the high energy bends. No stream mitigation is proposed due to the steep slopes which make it difficult to get machinery to the stream. The property is within the Lower White River Watershed. Information pertaining to this site can be found in Appendix R of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 10 acres of forest preservation.

Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Beanblossom West maternity colony and near the Beanblossom East northern long-eared bat maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater. The stream that flows through this property is the same stream that is located in the Modesto mitigation site (#61 above).

(63) Chambers Pike – This property is located in Monroe County. There is mature timber on the property and an existing house that will be razed. The property is within the Lower White River Watershed. The site was purchased as a hardship acquisition during the I-69, Section 5 right-of-way buying process. Information pertaining to this site can be found in Appendix Q of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 3 acres of forest preservation.

Status – The site was already purchased fee simple in 2011. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Indiana Creek Morgan and the Bryant Creek South northern long-eared bat maternity colonies, but not within any Indiana bat maternity colony. With this mitigation site, habitat for the northern long-eared bat has been preserved. The mitigation site has excellent foraging habitat for both bats. The mitigation sites is located adjacent to the Morgan Monroe State Forest.

(64) Creek Road – This property is located in Monroe County. The parcel is also south of the Bryant Creek Maternity Colony. Three parcels may be landlocked from the I-69 Preferred Alternative. The site consists of forest and agricultural land. Bryant Creek and its tributaries flow through the site. Four species of bats (hoary, northern long eared, red, and tri-color) have been recorded over Bryant Creek . An Indiana bat was captured on Bryant Creek (west) from this site. It is also adjacent to the Morgan-Monroe State Forest. Information pertaining to this site can be found in Appendix Q of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 13.1 acres of reforestation, 33.8 acres of forest preservation, and 3,618 linear feet of stream credits.

Status – A reevaluation document is anticipated to be completed in 2014. An offer is expected to be made to the property owners in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Bryant Creek South and the Little Indian Monroe northern long-eared bat maternity colonies. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(65) **<u>Cooksey Lane</u>** – This property is located in Morgan and Monroe Counties. Multiple parcels will be landlocked from the I-69 Preferred Alternative. The site consists of field or residential lawn and forest. Bryant Creek and its tributaries flow through this area. Four species of bats (hoary, northern long eared, red, and tri-color) have been recorded over Bryant Creek An Indiana bat was captured on Bryant Creek (west) from this site. Information pertaining to this site can be found in Appendix Q of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 60.8 acres of reforestation, 69.8 acres of forest preservation, and 3,602 linear feet of stream credits.

Status – A reevaluation document is anticipated to be completed in 2014. An offer is expected to be made to the property owners in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Bryant Creek South and the Little Indian Monroe northern long-eared bat maternity colonies. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(66) <u>Paragon</u> – This property is primarily located in Morgan County. The property includes large tracts of farmland with Bryant Creek. The site is flat with tree species of cottonwood, silver and red maple, sycamore, and American elm. The property is within the Upper White River watershed. Information pertaining to this site can be found in Appendix N of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 36.2 acres of reforestation, 28.1 acres of forest preservation, and 6,357 linear feet of stream credits.

Status – The CE was approved on September 26, 2013. The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Bryant Creek North northern long-eared bat maternity colony. This mitigation site protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(67) <u>Bryant Creek</u> – This property is located in Morgan County. Bryant Creek flows through this property and it is immediately downstream of an Indiana bat capture site. The property has an excellent mature upland forest consisting of oak, hickory, beech, and maple. The property is within the Upper White River watershed. Information pertaining to this site can be found in Appendix N of the

2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 8.1 acres of reforestation, 18.7 acres of forest preservation, and 2,380 linear feet of stream credits.

Status – A draft CE is anticipated to be completed in 2014. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony – This mitigation site is within the Bryant Creek North northern long-eared bat maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(68) Union – This property is

in Morgan County.

This property is in close proximity to seven Indiana bat roost trees and near the West Fork of the White River. Field observations noted the southwestern corner of property had hydrophytic vegetation and signs of flooding. The property is within the Upper White River Watershed. Information pertaining to this site can be found in Appendix N of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 0.9 acre of emergent wetland development, 1.9 acres of forested wetland development, 1.3 acres of scrub-shrub development, 3.1 acres of reforestation, 4 acres of forest preservation, and 338 linear feet of stream credits.

Status – The CE was approved on September 26, 2013. The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Bryant Creek North and Little Creek Morgan northern long-eared bat maternity colonies. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(69) <u>Big Bend</u> – This property is located in Morgan County. This property is in close proximity to seven Indiana bat roost trees. An Indiana bat roost tree was discovered in 2012 across the West Fork of the White River This site is located within a defined floodway and within the 100-year floodplain of the West Fork of the White River. The property is within the Upper White River Watershed. Information pertaining to this site can be found in Appendix N of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 99 acres of forest preservation.

Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Bryant Creek North maternity colony, and near the Little Creek Morgan northern long-eared bat maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(70) Little Indian Creek – This property is located in Morgan County. The site was purchased as a hardship acquisition during the I-69, Section 5 right-of-way buying process. Land use is predominantly agricultural (fallow field) with Little Indian Creek flowing through the central project area. Information pertaining to this site can be found in Appendix N of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 603 linear feet of stream credits. Coordination with the USFWS has determined this site will only be used for water resource-related mitigation.

Status – The site was already purchased fee simple in 2009. The CE was approved on December 10, 2013.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Little Creek Morgan northern long-eared bat maternity colony, and near the Jordan Creek maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(71) Principal – This property is located in Morgan County. Two parcels will be landlocked from the I-69 Preferred Alternative. The site consist of forest and open fallow field. Indian Creek and its tributaries flow through the site. Four species of bats (little brown, evening, red, and tri-color) have been recorded over Indian Creek An Indiana bat was captured and a number of state-listed species have also been recorded near the site. Information pertaining to this site can be found in Appendix P of the Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 38 acres forest preservation.

Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony – This mitigation site is near the Little Creek Morgan northern long-eared bat maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(72) <u>Nutter Ditch</u> – This property is in Morgan County. It is located adjacent to the West Fork of the White River . The site contains agricultural fields, bottomland forested areas and three large lakes. The property is within the Upper White River watershed. Three existing lakes make up the majority of the property as bordered by forests, agricultural fields and the West Fork of the White River. Riparian forests have large trees consisting of cottonwood, maple, sycamore, willow, and ash. The West Fork of the White River has signs of erosion along the high energy banks. This property is located within the 100-year floodplain of the West Fork of the White River. An Indiana bat roost tree was discovered in 2012 across the West Fork of the White River from this site Information pertaining to this site can be found in Appendix P of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 87.8 acres of reforestation and 239.5 acres of forest preservation.

Status – A draft CE is anticipated to be completed in 2014. The property owner is requesting a conservation easement. An offer is expected to be made to the property owner in 2014. INDOT will be responsible for the short-term monitoring of this site. The property owner will be responsible for the long-term management of this mitigation site.

Northern Long-Eared Bat Maternity Colony - This mitigation site is within the Lambs Creek northern long-eared bat maternity colony. It protects habitat for both the Indiana bat and the northern long-eared bat. Both species have maternity colonies in this area. With this mitigation site, habitat for the northern long-eared bat has been preserved and enhanced for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(73) **<u>Ravinia Woods</u>** – This property is . It is now managed by IDNR Division of Forestry as "Ravinia Woods," a unit of the Morgan-Monroe State Forest. The property is about 80% forested and is approximately from the West Fork (Bryant Creek) maternity colony. A narrow wooded riparian corridor along Burkhart Creek provides connectivity between the West Fork (Bryant Creek) colony and Ravinia Woods. Many small headwater streams and mature timber are on this property. This property is located within the Upper White River Watershed. Recently discovered Indiana bat roost trees are located Information pertaining to this site can be found in Appendix N of the Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 350 acres of forest preservation.

Status – INDOT provided funding to IDNR for the fee simple purchase of this site in 2004. IDNR owns and manages the property. Per the Tier 1 BO Addendum, USFWS agreed to use 1/3 of the required mitigation acres in Section 5 at Ravinia Woods from INDOT funding its acquisition in 2004. However, during recent coordination, USFWS stated the proposed mitigation area needs to be specifically determined within the total acres and a commitment is needed from IDNR Division of Forestry for no cutting of timber on the defined area for mitigation. As such, coordination is ongoing with IDNR.

Northern Long-Eared Bat Maternity Colony - This mitigation site is not within any northern long-eared bat or Indiana bat maternity colony. Nonetheless, it is an excellent forested area with Burkhardt Creek for the northern long-eared bat and the Indiana bat. Records for either species are not available in this area because it is located further than 2.5 miles from SR 37 and was not surveyed. Even though it is outside the SAA, the habitat for both species is there and is currently under IDNR (Division of Forestry) ownership and management.

(74) <u>Berean Valley</u> – This property is located
in Morgan County. The property is located south of Berean Road. The parcel contains upland and bottomland forests. The property is within the Upper White River watershed and contains Lamb Creek. Information pertaining to this site can be found in Appendix P of the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 245 acres of forest preservation.

Status – The property owner is requesting a fee simple purchase. An offer is expected to be made to the property owner in 2014. Because this mitigation consists solely of preservation, an environmental study is not required since it falls under the state Programmatic CE. INDOT will be responsible for the long-term management of this mitigation site. No formal monitoring will be required for this site. However, there is the possibility of an evaluation(s) in the future to verify adherence to the conservation easement.

Northern Long-Eared Bat Maternity Colony - This mitigation sites is an excellent forested area for the northern long-eared bat and the Indiana bat. Records for either species are not available in this area because it is located further than 2.5 miles from SR 37 and was not surveyed. Even though it is outside the SAA, the habitat for both species is present. It is all wooded with for the most part, mature timber. Excellent opportunities exist at this location for use by the northern long-eared bat and the Indiana bat. Lamb Creek and tributaries flow through the property.

(75) <u>Waverly Bog</u> – This property is located within Section 6 of I-69 and is at the edge of the Crooked Creek Maternity Colony, south of the Waverly. In is not within any northern long-eared bat maternity colony as determined by USFWS. The parcel is located in Morgan County. It consists of agricultural and forested land. Permission has been granted by USFWS to use this Section 6 site for Section 5 with the understanding that when mitigation sites are determined for Section 6, a mitigation site in Section 5 may be offered for the Indiana bat or northern long-eared bat, as appropriate. The property has existing wetlands with skunk cabbage, *Carex* species, appendaged waterleaf, and many different species of trees. The western property boundary is from the West Fork of the White River as connected via a ditch. The property is within the Upper White River watershed and contains Waverly Bog. In addition, this property contains a circumneutral seep. Additional information pertaining to this site can be found in Appendix O or the 2013 Annual Report dated January 22, 2014, including the I-69 Mitigation Tracking Property Report.

Mitigation Credit – Approximately 38.2 acres of reforestation and 81.1 acres of forest preservation.

Status – The CE was approved on September 26, 2013. The property owner is requesting a fee simple purchase. An offer was made to the property owner in 2013. INDOT will be responsible for the short-term monitoring of this site. INDOT will also be responsible for the long-term management of this mitigation site until an appropriate managing party is identified.

Northern Long-Eared Bat Maternity Colony - This mitigation sites is not within any northern long-eared bat maternity colony, but is located at the edge of the West Fork White River/Crooked Creek Indiana bat maternity colony. An adult male northern long-eared bat was captured not far from this mitigation site. This property is considered an excellent area for both the northern long-eared bat and the Indiana bat. Its location near the West Fork of the White River along with its wooded habitat and wetlands provides excellent bat habitat.

<u>Section 6</u>

Permission has been granted by USFWS to use Waverly Bog (located within Section 6) for mitigation for Section 5 with the understanding that when mitigation sites are determined for

Section 6, a mitigation site in Section 5 may be offered for the Indiana bat, as appropriate. Currently, efforts to find mitigation sites in Section 6 are pending since a Tier 2 NEPA document has not been completed for this section.

Revised Forest Data

For the northern long-eared bat BA Addendum, two different forest data sources were used to generate a hybrid forest data set for use in generating direct and indirect/cumulative impacts to forest resources. The goal was to use the most detailed and accurate data source where available. Figure 3 shows which forest data sources were used for each area analyzed.

2011 NLCD Forest

In the original Tier 1 BA, forest impacts were estimated using United States Geological Survey (USGS) Land Cover Geographic Information Systems (GIS) data. This data is a subset of the National Land Cover Data (NLCD). The NLCD was developed by the USGS with the United States Environmental Protection Agency (USEPA) to produce a consistent, land cover data layer for the continental U.S. The land cover layer is based on satellite imagery with 30-meter resolution. The forest data used in the original Tier 1 BA and the 2006 Tier 1 BA Addendum was based on the 1992 NLCD set.

For this 2014 northern long-eared Tier 1 BA Addendum, the most recent 2011 NLCD forest data was utilized for analysis of those portions of the SAA, WAA, maternity colonies and hibernacula foraging areas that are beyond the I-69 corridor or any design right-of-way that extended beyond the I-69 corridor.

Tier 2 Forest

For the hybrid data set, forest area within the I-69 corridor and within any portion of the right-of-way (representative alignment in the case of Section 6) for the six sections was based on Tier 2 forest data developed by the EEAC (Environmental & Engineering Assessment Consultant) firms for the EIS. Tier 2 forest data was created through photo interpretation of the best available aerial photographs supplemented by field reconnaissance. It includes groups of trees larger than 1 acre and wider than 120 feet.

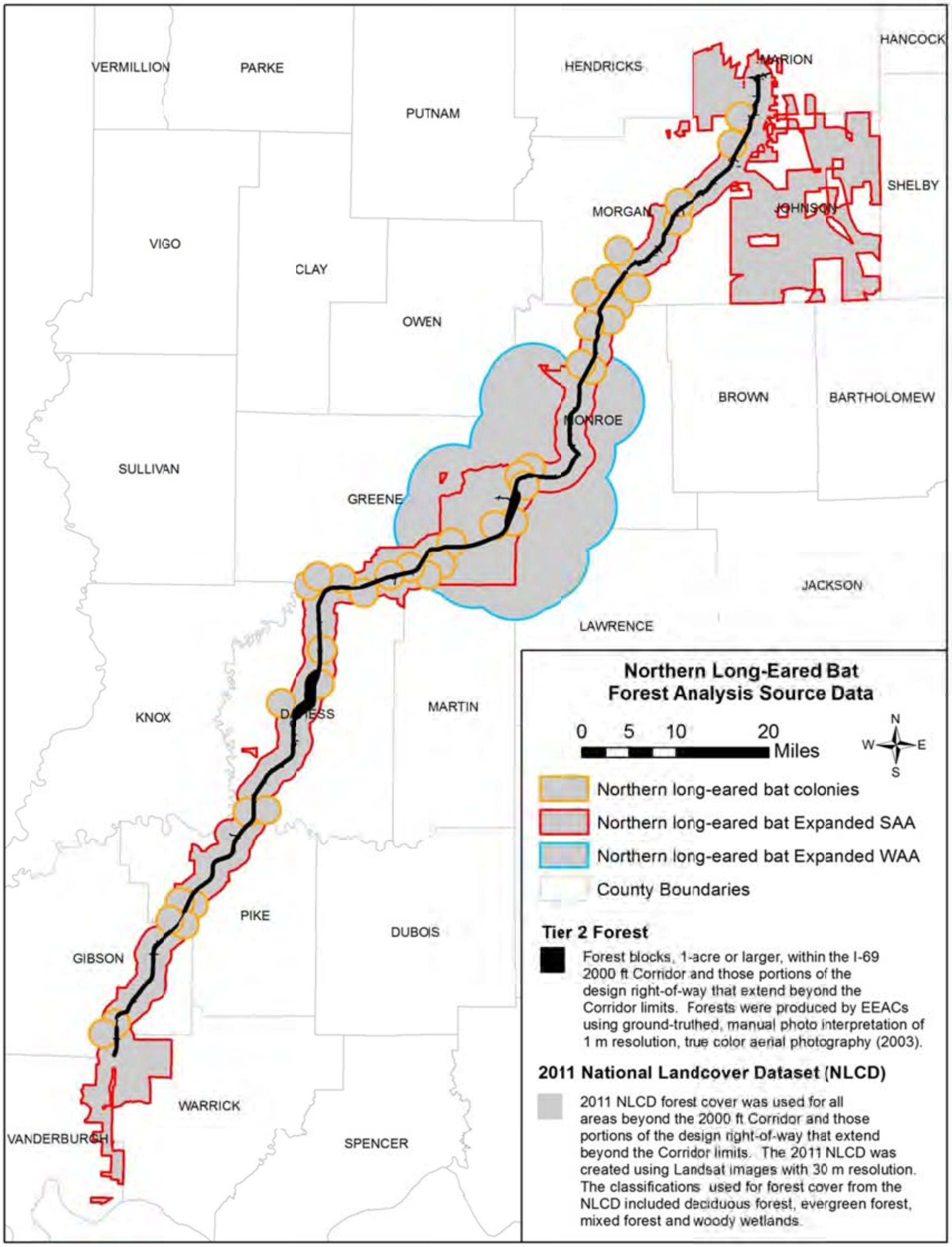

Figure 3: Forest Data Sources Used in the Northern Long-Eared Bat Tier 1 BA Addendum Analysis

Design Right-of-Way and Representative Alignments

In the original Tier 1 BA, a working alignment was used to estimate forest impacts, as well as other types of impacts. This working alignment ranged from 270 feet to 470 feet wide depending on terrain, number of expected lanes, and number of expected local access roads. It also included a 500-foot radius buffer at potential interchange locations. The working alignment was located in the approximate center of the corridor.

For the 2006 Tier 1 BA Addendum “representative” alignments were used for the entire project (Sections 1 through 6) to analyze direct forest and wetland impacts. The representative alignment for each section was the footprint for the alternative with the largest Tier 2 forest impacts, among those alternatives that were still under study as of November 14, 2005. Tier 2 forest impacts were determined using aerial photographs, high resolution aerial photographs for the corridor, and field reconnaissance.

For the 2014 northern long-eared bat Tier 1 BA, the design right-of-way was used for Sections 1 through 4 as the limits for defining those areas within the I-69 project area which have already been cleared of trees (i.e., direct forest impact). Similarly, the design right-of-way for Section 5 was used to define the limits where tree clearing has already taken place or where tree clearing is still required. Because the design for Section 6 has not currently been completed, the representative alignment for Section 6 from the 2006 Tier 1 BA Addendum was used to analyze direct forest impacts for this Tier 1 BA Addendum. This representative alignment may or may not end up being the preferred alternative, but is expected to have higher forest loss than the preferred alternative due to future efforts to further minimize forest impacts. In some instances, particularly for interchanges or connector roads, the alignment may extend outside the Tier 1 corridor.

Table 8 shows the direct impacts on Tier 2 forest resources for those areas within the current Section 5 design right-of-way that have not as yet been cleared and within the Representative Alignment for Section 6. Direct forest impacts for Sections 1 through 4 are considered zero because forests within the design right-of-way for these sections have already been cleared.

Table 8. Design Right-of-Way and Representative Alignment Impacts on Forest Cover	
Section	**Direct Impact Acreage**
1 Design Right-of-Way	0 acres
2 Design Right-of-Way	0 acres
3 Design Right-of-Way	0 acres
4 Design Right-of-Way	0 acres
5 Design Right-of-Way	172 acres[1]
6 Representative Alignment	314 acres[2]
Total	**486 acres**

[1] Forest cover impact acreage is based on the current Section 5 design right-of-way and the EEAC forest cover data, minus that portion of the Section 5 right-of-way that has been cleared as of the spring of 2014.
[2] Forest cover impact acreage for Section 6 is based on the calculations conducted for the Representative Alignment using the most recent Tier 2 forest cover data prepared by the EEAC in 2006-07.

Analysis of Direct, Indirect and Cumulative Impacts

At the 9 April 2014 meeting, USFWS discussed with INDOT and FHWA the range of impact analyses. Since construction of the roadway is completed in Sections 1-3 and tree clearing has been completed in Section 4, INDOT and FHWA are not required to complete Direct Analysis in Sections 1-4, but do need to complete indirect and cumulative impacts analysis in Sections 1-4. For Sections 5 and 6, USFWS requested Direct, Indirect and Cumulative Impact Analyses. Since tree clearing has been completed for most of the lower third of Section 5 (near Beanblossom Creek) and the WAA extends about 1.7 miles further north, USFWS requires only direct impact analysis for those locations within the WAA where tree clearing has not been completed.

Impact analysis in this document will be similar, but not exactly the same, as in the Tier 1 BA Addendum of 7 March 2006. The 2006 analysis considered 13 Indiana bat maternity colonies, the remaining SAA that included 2.5 miles on both sides from the centerline for the roadway excluding the maternity colonies, and a circle 5 miles in radius around each of the 14 hibernacula (constituting the Indiana bat WAA) to complete the impact analysis. Analysis for the northern long-eared bat included 38 maternity colonies, the remaining SAA that included 1.5 miles on both sides from the edge of the right-of-way for the roadway for Sections 1-5, and 1.5 miles on both sides from the centerline of the representative alignment in Section 6 excluding the maternity colonies. A WAA is defined as a circle 5 miles in radius around each of 55 hibernacula to complete impact analysis.

Impacts analysis differences in this document from 2006 were provided by communications with USFWS. Initially, INDOT, FHWA and USFWS agreed that the SAA developed for the Tier 1 BA

Addendum for the northern long-eared bat would be based on a 1.5 mile distance from the R/W in Sections 1 through 5 and the centerline of the representative alignment for Section 6. Subsequently, the SAA and WAA was expanded to include Traffic Analysis Zones (TAZs) areas where induced growth was identified during Tier 2 analysis (Figure 3).

INDOT, FHWA and USFWS have elected to eliminate the “Tree Cover Connectivity” analysis (Patch Analysis), as completed for the Indiana bat Tier 1 BA Addendum, for the assessment of the northern long-eared bat. This was originally intended to show how the new highway would fragment existing tree patches and its effect on the largest patches identified within each maternity colony. Because the highway is completed or under construction (trees already cleared) in Sections 1 through 4, and because the alignment for Sections 5 and 6 primarily follow SR 37 (which would only affect tree patches through removal of acreage along the edges), this analysis appears to have very little value in the assessment of northern long-eared bat in the Tier 1 BA. For these reasons, it has been eliminated in this analysis as concurred by USFWS.

As with the “Tree Cover Connectivity”, the “Tree Cover Proximity to Floodplain” evaluation in the original Tier 1 BA of 2006 was meant to assess and document the loss of forest within floodplains (Class 1), the loss of forest near specific stream order classes (Class 2) and the loss of tree cover distal to these systems (Class 3). This loss has already been incurred for Sections 1 through 4 and is not of critical concern for Sections 5 and 6. The action in Sections 5 and 6 is largely the expansion of an existing encroachment upon floodplain forests; therefore, it has been eliminated in this analysis as concurred by USFWS.

The intention of this document is to conduct the indirect and cumulative analysis for each of the maternity colonies as well as the 55 hibernacula comprising the collective WAA (as was done for the Tier 1 BA Addendum for the Indiana bat) with the following exceptions. The percentages used for estimating loss of agricultural land and forest within the TAZs will be taken from the Tier 2 BAs for Sections 1 through 5. Regarding cumulative impacts to forest resulting from legal drain maintenance, coordination with the respective counties to identify legal drains within the maternity colonies was conducted to determine if there are any maintenance plans that would necessitate tree clearing in the next 20 years. This information was incorporated into GIS data so that the estimation of forest loss along legal drains would be more realistic than the assumption in the 2006 BA (which was that all trees would be cleared within 75 feet on both sides of all legal drain).

Northern Long-eared Bat Hibernacula

For the purposes of this study, a northern long-eared bat hibernaculum is any cave where a northern long-eared bat has been found hibernating or has been harp trapped at an entrance. This definition has been approved by the USFWS (BFO). Northern long-eared bats are difficult to see hibernating in caves since they tend to roost in crevices are therefore remain mostly hidden in contrast to Indiana bats which are typically found on cave walls in the open. Northern long-eared bat numbers in caves are most likely underestimated in cave surveys for this reason.

At the time of the Tier 1 BA Addendum dated March 7, 2006, harp trap capture data for the northern long-eared bat was collected, as well as numbers of individuals observed during winter cave surveys in 2004-05 and 2005-06, but was not reported since it was not a federally listed species.

The northern long-eared bats often move between hibernacula throughout the winter, which may further decrease population estimates (Griffin 1940, p. 185, Whitaker and Rissler 1992b, p. 131; Caceres and Barclay 2000, pp. 2-3). Whitaker and Mumford (2009, p. 210) found that this species flies in and out of some of the mines and caves in southern Indiana throughout the winter. Such movements may be the reason why it was the most abundant species harp trapped. During 2004-05 and 2005-06 harp trapping efforts, 1,015 northern long-eared bats were captured.

Figure 4 has been redacted in its entirety to maintain the confidentiality of the data contained within.

Figure 4. WAA showing 55 hibernacula locations for the northern long-eared bat

In developing the WAA, 55 northern long-eared bat hibernacula were identified using USFWS's definition. The northern long-eared bat WAA (Figure 4) is quite similar to the Indiana bat WAA. However, it extends about 6 miles further north along SR 37 due to its presence at established via harp trapping All 55 northern long-eared bat hibernacula were buffered by 5 miles as was done for the 14 Indiana bat hibernacula in the 2006 Tier 1 Addendum.

I-69 Bat Surveys and Karst Studies

Since the publication of the Tier 1 BA Addendum dated March 7, 2006, several studies relating to the Indiana bat and karst features have been completed, and information for the northern long-eared bat comes from mist netting surveys for each I-69 Section. The surveys were completed within the SAA between 2004 and 2013, and in part within the WAA between 2012 and 2013. The mist netting reports listed below document observations of 337 northern long-eared bats.

(1) Section 1: I-69 Section 1 Pigeon Creek maternity colony pre-construction mist netting survey for the Indiana bat (*Myotis sodalis*). 16 December 2008 (Environmental Solutions & Innovations, Inc.)

(2) Section 1: I-69 Section 1 Pigeon Creek maternity colony 2009 post-construction mist netting survey for the Indiana bat (*Myotis sodalis*). 23 November 2009 (Environmental Solutions & Innovations, Inc.)

(3) Section 1: Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland Region from Elberfeld to Oakland City, Indiana, December 13, 2004 (Environmental Solutions & Innovations, Inc.)

(4) Sections 1, 2 and 3: I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 (2010 2nd year post-construction) and Sections 2 and 3 (2010 pre-construction surveys). 14 February 2011 (Environmental Solutions & Innovations, Inc.

(5) Sections 1, 2 and 3: I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 (2011 3rd year construction survey) and Sections 2 and 3 (2011 1st year construction surveys). 13 February 2012 (Environmental Solutions & Innovations, Inc.

(6) Sections 1, 2 and 3: I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 (2012 4th year construction survey) and Sections 2 and 3 (2012 2nd year construction surveys). 3 August 2012 (Environmental Solutions & Innovations, Inc.

(7) Sections 1, 2 and 3: I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 (2013 1st year post-construction survey) and Sections 2 and 3 (2013 1st year post-construction surveys). 6 January 2014 (Environmental Solutions & Innovations, Inc.

(8) Section 2: Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland Region from Oakland City to Washington, Indiana, December 13, 2004 (Environmental Solutions & Innovations, Inc.)

(9) Section 3: Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland Region from Washington to Scotland, Indiana, December 2004 (Eco-Tech, Inc.)

(10) Section 4: Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Crawford Upland and Mitchell Plain from Scotland to Bloomington, Indiana, December 13, 2004 (Environmental Solutions & Innovations, Inc.)

(11) Sections 1, 2, 3 and 4 4: Additional Telemetry and Roost Studies of the Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland, Crawford Upland, and Mitchell Plain Regions From Elberfeld to Bloomington, Indiana, September 14, 2005 – (Environmental Solutions & Innovations, Inc.)

(12) Section 4: I-69 pre-construction/construction period mist netting survey for the Indiana bat (*Myotis sodalis*) (Greene and Monroe Counties, Indiana) in the Lower White River Watershed. 19 December 2012 (Bernardin, Lochmueller and Associates, Inc.)

(13) Section 4: I-69 pre-construction mist netting survey for the Indiana bat (*Myotis sodalis*) at Site 18 (Greene County, Indiana) in the Lower White River Watershed. 17 January 2012 (Bernardin, Lochmueller and Associates, Inc.)

(14) Section 4: I-69 pre-construction/construction period mist netting survey for the Indiana bat (*Myotis sodalis*) (Greene and Monroe Counties, Indiana) in the Lower White River Watershed. 11 December 2013 (Bernardin, Lochmueller and Associates, Inc.)

(15) Section 5: Investigating Presence of the Indiana Bat during the Summer Maternity Season within the Mitchell Plain between Bloomington and Martinsville, Indiana, December 8, 2004 (BHE Environmental, Inc.)

(16) Sections 5 and 6: Identification of Indiana Bat Roost Trees along the Proposed Interstate 69 between Bloomington and Indianapolis, Indiana, January 2006 (BHE Environmental, Inc.)

(17) Section 5: Mist netting survey for the Indiana bat (*Myotis sodalis*) in 2012 from Bloomington to Martinsville. 18 June 2012. Environmental Solutions and Innovations, Inc.

(18) Section 6: Summer habitat for the Indiana Bat (*Myotis sodalis*) within the Martinsville Hills from Martinsville to Indianapolis, Indiana, December 15, 2004 (Ecological Specialties, LLC)

A cave reconnaissance was conducted within five miles of the proposed corridor in portions of Monroe, Greene, and Lawrence Counties. The purpose of this reconnaissance was to identify and visit caves that represented potential winter hibernacula for the Indiana bat and other bats, and make recommendations regarding further detailed investigations. The results of this study can be found in the report listed below.

(19) Winter Action Area: I-69 Evansville to Indianapolis Tier 2 Studies Cave Reconnaissance for Indiana Bat Hibernacula, October 2005 – (Indiana Geological Survey)

Detailed autumn, winter, and spring habitat survey reports were prepared for Sections 4 and 5 (the only Sections in karst areas). The reports listed below contain detailed information for all winter habitat survey work that was conducted in these two sections.

(20) 2005: Autumn, Winter, and Spring Habitat for the Indiana Bat (*Myotis sodalis*) Within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana, September 7, 2005 (Environmental Solutions & Innovations, Inc.)

(21) 2005: Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana, 2005. (BHE Environmental, Inc.)

(22) 2006: Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana 2006, January 2006. (BHE Environmental, Inc.)

(23) 2006: Autumn 2005 and Winter 2006 Habitat for the Indiana Bat (*Myotis sodalis*) Within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana. (Environmental Solutions & Innovations, Inc.)

These 23 reports provide much information about the northern long-eared bat. Such information will be discussed further in the sections that detail summer mist netting and bridge survey results and fall, winter and spring cave surveys and is summarized in Exhibits 1, 2 and 3 of this Tier 1 BA Addendum for the northern long-eared bat.

In addition to the above efforts in studying Indiana bat and other bats (including the northern long-eared bat), INDOT, FHWA and USFWS have studied may karst features and other limestone resources. These included in depth studies on springs, invertebrates, connectivity and much more. The following reports are the result of these investigations.

(24) I-69 Evansville to Indianapolis Tier 2 Studies – Survey of Karst Features Report, Section 4, US 231 to SR 37 (Contains Confidential Information). June 2010. Prepared by Hydrogeology Incorporated from Bloomington, Indiana.

(25) I-69 Evansville to Indianapolis Tier 2 Studies – Final Karst Feature and Groundwater Flow Investigation Report, Section 5, SR 37 south of Bloomington to SR 39. April 2013. Prepared by Ozark Underground Laboratory from Protem, Missouri.

The above studies focused on characterizing karst features and related groundwater flow paths relevant to Sections 4 and 5, and identifying caves, springs, sinkholes, and other karst features that could be impacted by construction and use of the proposed interstate highway.

Legal Drains

Regarding cumulative impacts to forest resulting from legal drain maintenance, coordination with the respective counties was conducted to identify which water bodies within the maternity colonies were legal drains and investigate if there are any plans to conduct maintenance that would necessitate tree clearing in the next 20 years. This information was incorporated into the GIS data so that the estimation of forest loss along legal drains is more realistic than the assumption that tree loss within 75 feet of each side of all legal drains would occur, as was the methodology in 2006. It was agreed in interviewing experienced authorities that such a methodology was an overestimation and not reasonable.

In contacting County Surveyors and Directors/Managers for the Drainage Board Conservancies, Ditches and Levees, the following guidance was offered by them:

1. Legal drains are not cleared often and if so, they are usually cleared near roads.
2. When cleared, many counties (like Morgan County) only clear one side and excavate from that side, leaving the other bank undisturbed to provide stabilization. Afterwards, the stream banks may be sprayed each year to remove new seedlings, such as willows, cottonwoods and sycamores.
3. When trees fall into legal drains, they are removed to prevent flow blockage, just like beaver dams are removed when they are built in streams. These are typically spot removals.
4. If legal drains do not have trees now, it is reasonable that they will not have trees in 20 years due to maintenance.
5. It is difficult for any County Surveyor to say where, when and how much clearing may take place along a legal drain in the next few years much less the next 20 years. But

historically, from what they have experienced, only a small fraction of clearing is done. It requires time, money and access. Pike County recognized 1-2% of the total length of legal drains in the county would likely be cleared in the next 20 years.

6. Legal drains can have their banks cleared back 75 feet on both sides, but it rarely happens to any significant degree.
7. A general consensus was that these legal drains are managed as waterways today and will continue as such for the future.

Based on the information provided above, the following methodology was developed to more accurately estimate anticipated tree removal along legal drain lengths within a maternity colony.

1. From coordination with the County Surveyor or Drainage Board Directors, GIS data or a listing of legal drains within the northern long-eared bat maternity colonies was obtained and mapped using a 24K NHD steam layer as a base. In the case of Pike County, all streams in the county are considered legal drains. In the case of Monroe County, there are no legal drains. For the remaining counties, specific streams were identified as legal drains.
2. Each of these streams was inspected using 2011 and/or 2013 aerial photography to determine which reaches currently supported tree cover. It was noted and coded in GIS as to if the cover was on both sides of just one side.
3. Where tree cover occurred, it was assumed to be at least 75 feet wide on one or both sides of the stream.
4. To estimate tree clearing within each colony, the total length of tree covered stream channel within each colony was multiplied by 75 feet for one sided cover and 150 feet for two sided cover to determine the total acreage of tree cover along legal drains within the colony. This acreage was then multiplied by 0.05 (5%), considered to be a liberal estimate of probable tree clearing over the next 20 years, to determine the acreage of cumulative legal drain tree loss.

The County Surveyors or Drainage Board Directors experienced in clearing legal drains agreed that such a methodology was reasonable.

Northern Long-Eared Bat Mine Use

Knowing that northern long-eared bat use of abandoned mines as roosts has been documented in the literature, the USFWS BFO staff requested that the Tier 1 BA Addendum for this species investigate to see if there are any records of northern long-eared bat mine usage within the I-69 study area. To this end, the Environmental Specialist/Technical Management Supervisor for the IDNR Division of Reclamation, Abandoned Mine Lands Program was contacted in May 2014 to ascertain if IDNR had any records of northern long-eared bat occurrence in mines. IDNR provided a GIS file that included the location of all mines that had been gated due to the presence of bats. From this listing, four mines were identified within 5 miles of the I-69 right-of-way where bat presence had been documented. These included the following AML IDs all of which are in Pike County:

.

A request for any specific species records from these four mines was submitted to IDNR Division of Reclamation for the purposes of determining if northern long-eared bat usage had been established. IDNR records indicated northern long-eared bat occurrences in A

Section 2 right-of-way and included between two and nine male northern long-eared bats per visit from surveys conducted in May, June and October 1996 and September 1997.

Section 3 right-of-way just north of Petersburg and included 9 male and 6 female bats from a September 1998 survey. These records suggest summer and early fall usage of the mines by bats, not atypical for males, and early fall usage by non-reproductive females. The available data from the IDNR records neither confirms or discounts the use of these abandoned mine features as winter hibernacula for the northern long-eared bat.

IDNR indicated that they now only conduct bat presence/absence surveys to determine if a mine is being used by bats, regardless of species, for the purposes of installing gate closures. As such, there is no species specific data available from IDNR since the 1990s surveys on any abandoned mines under their authority.

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Description and Results of 2004 to 2014 Summer Surveys for the Northern Long-Eared Bat

This chapter includes the following topics:

Introduction

The northern long-eared bat (*Myotis septentrionalis*) is expected to be listed as endangered by the U.S. Fish and Wildlife Service (USFWS). In anticipation of "conferencing" between INDOT/FHWA and the USFWS, a summary of data specific to the northern long-eared bat has been prepared to highlight what is currently known about it relative to the I-69 project (Exhibits 1, 2 and 3).

From 2004 through to 2014, various seasonal field investigations have been conducted to determine bat use of summer habitat resources throughout the I-69 corridor. Exhibit 1 illustrates the level of effort invested in bat surveys including bridge surveys, mist netting, and also shows distribution and seasonality of sampling sites. Such information shows a methodology that provides for a strong foundation in sampling distribution that is generally dispersed throughout the project at different seasons.

Presently, Sections 1, 2 and 3 from I-64 to US 231 have been constructed and are open to traffic and annual summer monitoring, including radio-telemetry for Indiana bat captures and roost tree identification, is being conducted at 22 locations. Section 4 from US 231 to SR 37 at Bloomington is currently under construction and there are 11 sites for which annual summer surveys are being conducted as "during construction" monitoring. A meeting with USFWS on 9

April 2014 indicated that for these 4 sections, INDOT and FHWA did not need to complete any telemetry studies for the northern long-eared bat.

For Section 5, the Tier 2 BA/BO has been completed, a ROD has been approved and tree clearing has been initiated at several locations along the existing SR 37 corridor from Bloomington to Martinsville. In 2012 a mist netting survey of the original 24 survey sites in Section 5 from 2004 was conducted. From 2004 to the present, data from the surveys have included all species of bats; however, because the northern long-eared bat was not listed as endangered during this time period, only capture data is available (i.e., radio-telemetry resulting in the identification of northern long-eared bat roost sites was not conducted). From such capture data, USFWS developed 38 northern long-eared bat maternity colonies along the SAA. The radii are 1.5 miles from point of capture. In Section 5, INDOT and FHWA completed 8 monitoring sampling locations in 2014 following protocol for radio-telemetry and emergence counts for the northern long-eared bat and the Indiana bat. When Section 6 begins, INDOT and FHWA are to re-mist net the original 29 sampling sites, and follow the new protocol in screening, acoustics, radio-telemetry and emergence counts.

The purpose of this chapter is to summarize the effort and results of the various summer habitat bat surveys for all species, provide a synopsis of the capture data for the northern long-eared bat, and provide a description of potential maternity colony limits for the northern long-eared bat.

Bridge/Culvert Surveys

In 2004 and 2005, approximately 259 bridges and culverts were inspected for bats in spring and summer. Eight of these structures were found to support bats. Table 9 shows the results for bats found under bridges in the SAA. are located in the upper part of Section 6; are located north of Bloomington in Section 5; and the are located in the upper middle part of Section 4. Sections 1, 2 and 3 did not have any bridges with bats, except for in Section 3. Formal studies were completed on this bridge from 2006 to 2011. Currently, a paper entitled *Bat Occupancy under a Bridge in Southwestern Indiana* is in review for publication that includes information on bats under the and environmental conditions that make it conducive to bat roosting, feeding, reproduction, and socialization (Appendix B).

The bridge showing the most bats was the large bridge over . One-hundred twenty-one visits to this bridge from 2004 to 2011 yielded approximately 9,093 bats from 5 species. They were 7,377 little brown (MYLU), 890 Indiana (MYSO), 781 big brown (EPFU), 43 tri-colored (PESU) and 2 gray bats (MYGR). The Indiana bat and gray bat are federally listed species. This bridge did not show any northern long-eared bats (MYSE) even though they are very common in the area (Exhibit 3).

Table 9. Bats found under eight existing bridges in the I-69 study area from 2004-11.

	Bridge over Creek		MYSO	MYGR	MYSE	MYLU	EPFU	PESU	Unk	Total
Sec 6		2004					20			20
							8			8
Sec 5		2004			2	2		6	3	13
								1		1
Sec 4		2004					2			2
					2					2
									1	1
Sec 3		2004	3			5		14		22
		2005	9			485	7			501
		2006-2011	878	2		6887	774	29		8,570
	Total		**890**	**2**	**4**	**7379**	**811**	**50**	**4**	**9,140**

Shaded species are federal endangered or proposed listed species

Of the 259 bridges and culverts investigated for bats in 2004 and 2005, only 2 bridges supported northern long-eared bats. There were 2 northern long-eared bats (Section 5) and 2 found (Section 4). For the bridge, the presence of bats near concentrations of graffiti prompted INDOT, FHWA and the USFWS to have a 6-foot chain-linked fence with locked gates installed in April 2006 at both ends of the bridge. In September 2007, signage was erected that stated “Coordination with INDOT and USFWS was required to work on or within 200 feet of the bridge”. Both of these activities were conservation measures identified in the Tier 1 BO.

In addition, and of worldwide significance, INDOT and FHWA found data loggers or I-Buttons (used to record temperatures) under the bridge made ultrasonic noise that bats (especially *Myotis spp.*) avoided. This discovery is very significant because these I-Buttons have been used in caves and on bats. The noise emitted in the cave would echo as well as the noise emitted on the bat could be considered harassment. So such a discovery has helped all bats (Indiana bat, northern long-eared bat and others) and is discussed in Willis, K. R., J. W. Jameson, P. A. Faure, J. G. Boyles, V. Brack, Jr. and T. H. Cervone (2009). The paper is entitled *Thermocron I-Button and IB Bat Temperature data loggers emit ultrasound* in the Journal of Comparative Physiology B: Biochemistry, Systemic, and Environmental Physiology. Volume 179(7):867-874. From such a find, the USFWS sent out a statement that all data loggers and I-Buttons need to be checked for noise emissions (Appendix C).

Mist Netting

I-69 is about 142 miles in length and divided into 6 different sections. Table 10 shows a summary of the bat surveys for I-69 in terms of Relative Abundance, Frequency of Occurrence and Captures per Net Night that include all species, including the northern long-eared bat. Collectively, 4,119 bats from 9 species were captured from 2004 to 2014 (9 years of survey). These included red bat (n=1,072, 26%), big brown bat (n= 834, 20%), little brown bat (n=703, 17%), tri-colored bat (n=630, 15%), evening bat (n=364, 9%), northern long-eared bat (n=339, 8%), Indiana bat (n=112, 3%), hoary bat (n=31, 1%), and silver-haired bat (n=16, <1%) bats. Eighteen bats are unknowns since they escaped from the net before identification.

Species diversity was relatively consistent for 2004, 2005, 2010, 2011, 2012, 2013 and 2014 (Range = 5 to 6), with the exception of 2008, 2009 and 2014 (each about 3.6). During 2008 and 2009, only Section 1 was sampled, and no little brown and only one northern long-eared bat were captured. Lack of preferred habitat in Section 1 for these two species may account for differences.

From 1,548 net nights of effort, 163 female and 169 male northern long-eared bats (seven of unknown gender) were captured. Of the 189 sites sampled, 69 showed northern long-eared bats (36%). Northern long-eared bats were captured at 87% of the sites where Indiana bats were captured. By comparison, Indiana bats were captured at 38% of the sites where northern long-eared bats were captured. This difference in percentages is attributable to three times more northern long-eared bats than Indiana bats (339 to 112) over the nine year data period, and the more general geographic distribution of the northern long-eared bat.

However, observations suggest it is not uncommon to have these two species both present at individual survey sites since they share similar habitat and habits. Refer to the similar summer habitat for these two species reported in the USFWS “Northern Long-Eared Bat Interim Conference and Planning Guidance” (Regions 2, 3, 4, 5 and 6) dated January 6, 2014. (pp. A5 and A6)

Captures per net night showed variability throughout each species and between years. Comparing 2004 (which had the greatest number of survey sites and net nights) with 2012 and 2013 (which is after White Nose Syndrome was reported in Indiana on February 1, 2011), it would appear that population trends of the red bat, big brown bat, tri-colored bat and evening bat are reasonably constant. However, populations trends for the little brown bat, northern long-eared bat and Indiana bat (the myotid species) are questionable.

Table 10 Relative Abundance, Frequency of Occurrence and Captures Per Net Night.

Species	**Relative Abundance**										
Year Sections	**2004** 1 2 3 4 5 6	**2005** 1 2 3 4 5 6	**2008** 1	**2009** 1	**2010** 1 2 3 4	**2011** 1 2 3 4	**2012** 1 2 3 4 5	**2013** 1 2 3 4	**2014** 1 2 3 4 5	**Total**	**% of Total**
Lasiurus borealis	327	74	27	6	125	85	235	81	112	1072	26%
Eptesicus fuscus	266	49	12	2	80	69	194	54	108	834	20%
Myotis lucifugus	259	44			138	121	121	19	1	703	17%
Perimyotis subflavus	219	49	32	10	64	91	108	43	14	630	15%
Myotis septentrionalis	145	47	1		29	34	75	6	2	339	8%
Nycticeius humeralis	105	28	10	7	51	40	40	32	51	364	9%
Myotis sodalis	49	7	3	1	7	8	21	6	10	112	3%
Lasiurus cinereus	7	2			1	1	9	3	8	31	< 1%
Lasionycteris noctivagans					1		7	1	7	16	< 1%
unknown	1	2				1	5	6	3	17	< 1%
Total	1378	302	85	26	496	450	815	251	315	4118	100%
Diversity ($D=1/\Sigma P_i^2$)	5.80	5.98	3.60	3.56	5.06	5.37	5.23	4.91	3.62		

Table 10 Relative Abundance, Frequency of Occurrence and Captures Per Net Night.

Survey Data	Frequency of Occurrence									
	2004	**2005**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
# of Sites Sampled	149	44	5	4	27	23	57	33	41	383
# of Sites with *Myotis sodalis*	31	6	2	1	6	6	9	5	8	45
# of Sites with *Myotis septentrionalis*	62	22	1	0	10	15	27	4	2	102
# of Sites with *Myotis sodalis* and *Myotis septentrionalis*	18	4	0	0	2	3	4	0	0	39
% of *Myotis sodalis* Sites with *Myotis septentrionalis*	58%	67%	0%	0%	33%	50%	44%	0%	0%	87%
% of *Myotis septentrionalis* Sites with *Myotis sodalis*	29%	18%	0%	0%	20%	20%	15%	0%	0%	38%
Species	**Captures Per Net Night**									
	2004	**2005**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean ± 1 SD***
Lasiurus borealis	0.55	0.60	1.04	0.33	1.14	0.87	0.88	0.60	0.58	0.73 ± 0.25
Eptesicus fuscus	0.45	0.40	0.46	0.11	0.73	0.70	0.72	0.40	0.56	0.50 ± 0.19
Myotis lucifugus	0.43	0.36	0.00	0.00	1.25	1.23	0.45	0.14	0.01	0.43 ± 0.47
Perimyotis subflavus	0.37	0.40	1.23	0.56	0.58	0.93	0.40	0.32	0.07	0.54 ± 0.33
Myotis septentrionalis	0.24	0.38	0.04	0.00	0.26	0.35	0.28	0.04	0.01	0.18 ± 0.15
Nycticeius humeralis	0.18	0.23	0.38	0.39	0.46	0.41	0.15	0.24	0.26	0.30 ± 0.11
Myotis sodalis	0.08	0.06	0.12	0.06	0.06	0.08	0.08	0.04	0.05	0.07 ± 0.02
Lasiurus cinereus	0.01	0.02	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.02 ± 0.01
Lasionycteris noctivagans	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.04	0.04	0.01 ± 0.01
Unknown	0.00	0.02	0.00	0.00	0.00	0.01	0.02	0.04	0.02	0.01
Total Net Nights	597	123	26	18	110	98	268	134	194	**1,374**
Yearly captures per net night	2.31	2.46	3.27	1.44	4.51	4.59	3.04	1.87	1.62	2.79 ± 1.10

*SD refers to Standard Deviation

Radio-telemetry and Roost Tree Identification

Radio-telemetry studies for the northern long-eared bat were not conducted because it was not a listed species during prior studies. Based upon USFWS guidance provided on 9 April 2014, INDOT and FHWA monitored eight mist netting sites in Section 5 in 2014. During 2014 surveys of Section 1, 2, 3, 4 and 5, only 2 male northern long-eared bats were captured in Section 5. Protocol did not warrant placing a radio-transmitter on these 2 males because the protocol directs that males captured the first night at a site would not be fitted with a radio-transmitter so as to save the transmitters for females. If no females are captured on the first night for a site, then males captured on the second night could be transmitted provided a female was not captured earlier that same night. No female northern long-eared bats were identified in the mist netting survey in Section 5. For this reason, no roost data is available.

FHWA/INDOT capture data for 339 northern long-eared bats from 2004-2014 are provided in Table 11. USFWS stated at a meeting dated 9 April 2014 that FHWA and INDOT do not need to complete any radio-telemetry studies in Sections 1-3 (since it has been constructed), nor in Section 4 (since it has had tree clearing completed). FHWA and INDOT are required to complete future radio-telemetry studies and emergence counts in Sections 5 and 6 on the northern long-eared bat following the USFWS' established methodology.

Maternity Colonies

Maternity colonies were identified by the USFWS Bloomington Field Office (BFO) using the best information available. The maternity colony analysis considered: (a) Capture sites for the northern long-eared bat from 2004 to present, especially for reproductive females and juveniles; (b) Habitat evaluations that follow preferred habitat documented by USFWS for the northern long-eared bats, (c) Other data from nearby studies, such as Crane, and list of northern long-eared bats caves in Indiana, and (d) Maps (e.g., aerials, GIS, USFWS, and others). Maternity colonies for northern long-eared bats have a 1.5 mile radius centered from capture site and were developed independently of any Indiana bat maternity colonies. There are 38 northern long-eared bat maternity colonies identified along I-69 by USFWS (Exhibit 3).

Section 1 has 2 maternity colonies; Section 2 has 6 maternity colonies; Section 3 has 8 maternity colonies; Section 4 has 9 maternity colonies; Section 5 has 9 maternity colonies; and Section 6 has 4 maternity colonies.

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Table 11: Summary of Northern Long-Eared Bat Captures Along the Proposed I-69 Corridor in 2004, 2005, 2008, 2009, 2010, 2011, 2012, 2013 and 2014 (in part)

Section	# Adult Pregnant Females	# Adult Lactating Females	# Adult Post-Lactating Females	# Non-Reproductive Adult Females	# Juvenile Females	# Undetermined Adult Females	# Adult Males	# Juvenile Males	# Undetermined	Total # Northern Long-Eared Bats
2004										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	1	9	1	0	2	1	0	14
3	7	13	1	0	0	0	4	5	5	35
4	3	3	5	1	2	0	30	0	1	45
5	0	6	2	1	6	0	11	4	0	30
6	0	0	2	1	3	0	12	3	0	21
2004 TOTAL	10	22	11	12	12	0	59	13	6	145
2005										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	1	3	0	0	2	0	0	6
3	0	0	1	5	0	1	3	0	0	10
4	0	0	0	2	3	1	16	1	1	24
5	0	0	0	0	0	0	1	0	0	1
6	0	1	0	0	4	0	1	0	0	6
2005 TOTAL	0	1	2	10	7	2	23	1	1	47
2008										
1	0	0	0	0	0	0	0	1	0	1
2008 Total	0	0	0	0	0	0	0	1	0	1
2009										
1	0	0	0	0	0	0	0	0	0	0
2009 Total	0	0	0	0	0	0	0	0	0	0
2010										
1	0	0	0	0	0	0	0	0	0	0
2	0	1	1	0	0	0	4	0	0	6
3	0	9	4	0	0	0	4	2	0	19
4	0	0	1	1	0	0	2	0	0	4
2010 Total	0	10	6	1	0	0	10	2	0	29
2011										
1	2	0	0	0	0	0	1	0	0	3
2	2	0	0	0	0	0	5	0	0	7
3	0	0	4	1	8	0	2	6	0	21
4	0	1	0	0	0	0	2	0	0	3
2011 Total	4	1	4	1	8	0	10	6	0	34
2012										
1	0	0	0	0	0	0	0	1	0	1
2	1	2	0	0	0	0	3	0	0	6
3	1	0	0	1	0	0	0	0	0	2
4	0	1	0	0	0	0	4	0	0	5
5	14	0	0	0	0	0	20	0	0	34
2012 Total	16	3	0	1	0	0	27	1	0	48
2013										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	2	0	0	0	0	2	0	0	4
2013 Total	0	2	0	0	0	0	2	0	0	4
2014										

Table 11: Summary of Northern Long-Eared Bat Captures Along the Proposed I-69 Corridor in 2004, 2005, 2008, 2009, 2010, 2011, 2012, 2013 and 2014 (in part)

Section	# Adult Pregnant Females	# Adult Lactating Females	# Adult Post-Lactating Females	# Non-Reproductive Adult Females	# Juvenile Females	# Undetermined Adult Females	# Adult Males	# Juvenile Males	# Undetermined	Total # Northern Long-Eared Bats
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	2	0	0	2
2014 Total							2			2

Table 12. Comparison of the northern long-eared bat in Indiana bat maternity colonies.

Maternity Colonies	Number of Myotis septentrionalis in Myotis sodalis Maternity Colonies	Number of Myotis septentrioalis Capture Sites in Myotis sodalis Maternity Colonies	Number of Female/Juvenile Myotis septentrionalis in Myotis sodalis Maternity Colonies	Number of Female/Juvenile Capture Sites in Myotis sodalis Maternity Colonies
Pigeon Creek	4	3	2	1
Patoka River	12	8	2	2
Flat Creek	12	6	4	2
E. Fork White River	11	5	4	3
Veale Creek	1	1	0	0
W. Fork White River	53	9	36	5
Doans Creek	14	3	2	2
Plummer Creek	19	8	4	3
Little Clifty Branch	10	4	1	1
Indian Creek	28	8	14	5
Beanblossom Creek	11	2	10	1
Bryant Creek	11	3	9	3
Lambs Creek	5	1	2	1
Clear Creek	11	4	9	3
Crooked Creek	7	3	2	1
Pleasant Run Creek	9	4	3	3
Total	211	68	101	34
% in MYSO colonies	NA	68/102 = 67%		34/53 = 64%
Total Number of Sample Sites				189
Total Number of Sample Sites with any Bat Capture				173
Total Number of Sample Sites with MYSO Capture				45
Total Number of Sample Sites with MYSE Capture				102
Total Number of Sample Sites with MYSE Juvenile or Reproductive Female Capture				53

Note: There were 10 *Myotis septentrionalis* capture sites within 2.5 miles of 2 different maternity colonies

In Exhibit 2, the Indiana bat maternity colonies have been superimposed onto northern long-eared bat maternity colonies to show the amount of overlap between the two species. This illustrates that 15 of the 16 established Indiana bat maternity colonies are within the northern long-eared bat maternity colonies. This suggests a highly significant similarity in habitat use for these two species. It would have been 100%, but the “Indiana Bat” Veale Creek Maternity Colony was the exception. USFWS did not determine a northern long-eared bat colony here (even though an adult male northern long ear was captured in this Indiana bat maternity colony) because there were no female northern long-eared bats captured nearby.

Table 12 shows that 67% of the total northern long-eared bat capture sites and 64% of the northern long-eared bat female/juvenile capture sites are found within Indiana bat maternity colonies. If one expands further out from these 16 Indiana bat maternity colonies, this larger area would include a higher percent of the northern long-eared captures. The overlap of the two species was especially similar in Sections 1, 2, 4 and 6. In Section 3, there were three northern long-eared bat maternity colonies (Thousand Acre Woods, South Fork Prairie Creek, Smothers Creek) north of Washington and one southeast of Newberry (First Creek East) that had northern long-eared bats, but no Indiana bats. In Section 5, the lower third was devoid of both potential northern long-eared bat maternity colonies and Indiana bat maternity colonies.

Mitigation Sites for Summer and Winter Habitat

Of the 75 mitigation sites in I-69, many have been purchased in Sections 1-5. Approximately 10 square miles of mitigation sites have been acquired with an additional 2-3 square miles to be acquired in the near future. Mitigation efforts in Section 6 are anticipated to provide an additional 2-3 more square miles of mitigation acreage.

The mitigation properties provide for preservation of existing forests, reforestation and wetland/stream development and help protect existing and future habitat for the northern long-eared bat and Indiana bat, other wildlife and plants, and karst/groundwater resources. All mitigation properties have been approved by the USFWS as good to excellent habitat for the Indiana bat and are in or near Indiana bat existing maternity colonies. These sites are very suitable as mitigation for the northern long-eared bat.

Two areas that have shown many northern long-eared bats and Indiana bats is in the Patoka River area in Section 2 and along the West Fork of the White River, especially southwest of Newberry in Section 3. To protect and help these two species, INDOT and FHWA have worked with the Patoka River National Wildlife Refuge to assist the Refuge in acquiring land within and near its acquisition boundary, and are continuing to work with the Refuge in acquiring additional land. Approximately 565 acres of mitigation land are planned to be acquired and conveyed to the Refuge. Some of this 500-600 acres of land is currently in the Refuge's ownership. In addition, a 355 acre mitigation site near Newberry along the West Fork of the White River will be conveyed for management by the Indiana Department of Natural Resources when mitigation is proven successful. These mitigation areas will be protected in perpetuity.

Fifty-eight of the mitigation sites (77%) are within or near (within ½ mile) of northern long-eared bat maternity colonies. The 17 that are outside were located there because FHWA, INDOT and USFWS determined that these would provide winter habitat for these species. Of these 17 mitigation sites, 12 were principally purchased for winter habitat for the Indiana bat and other bats, including the northern long-eared bat. The remaining 5 mitigation sites were located in biologically attractive habitats further from the known maternity colonies.

Exhibit 2 shows a very high degree of overlap of the two species maternity colonies. Data shows that when an Indiana bat is captured, 87% of the time a northern long-eared bat was captured at the same location. No other species showed such a high relationship as that of the Indiana bat with the northern long-eared bat.

The following northern long-eared bat maternity colonies have Indiana bat mitigation sites within or near them that offset forest impacts. Numbers follow the legend in Exhibit 3. Mitigation sites range from 1 to 7 within each of the following northern long-eared bat maternity colonies, except First Creek East and Jordan Creek. They had but 1 mitigation site near. "Near" is within ½ mile.

Sections	**Northern Long-Eared Bat Maternity Colony**	**Mitigation Site [near = within ½ mile]**
Section 1	Pigeon Creek South	(1) Pigeon Creek
	Pigeon Creek North	(1) Pigeon Creek
Section 2	Robinson South	(2) Patoka - Hurricane, (3) Oxbow, (4) Canal, (5) Dongola Bridges (6) Logan and (7) South Fork
	Patoka South Fork	(2) Patoka - Hurricane, (4) Canal, (5) Dongola Bridges, (6) Logan, (7) South Fork and (8) Flat Creek

Sections	Northern Long-Eared Bat Maternity Colony	Mitigation Site [near = within ½ mile]
	Robinson North	(6) Patoka - Logan [near: (4) Patoka-Canal, (5) Dongola Bridges, (7) South Fork and (8) Flat Creek]
	Flat Creek	(6) Patoka - Logan and (8) Flat Creek [near: (4) Patoka-Canal and (5) Dongola Bridges]
	East Fork White River	(11) Sandy Hook
	Aikman Creek	(11) Sandy Hook [near: (10) Horseshoe]
Section 3	White River - Weaver Ditch	(13) Newberry
	White River - Fourmile Creek	(13) Newberry
	First Creek West	(15) South Newberry [near: (14) West Fork
	First Creek East	[near: (15) South Newberry]
	Doan's Creek West	(16) Doan's Creek [near: (18) Scotland]
Section 4	Bogard Creek	(19) Dowden Ridge [near: (16) Doan's Creek, (17) Crane, (18) Scotland and (20) Taylor Ridge
	Doan's Creek East	(19) Dowden Ridge and (20) Taylor Ridge
	Black Ankle Creek	(20) Taylor Ridge, (21) Black Ankle and (22) Cooper Cemetery [near: (24) Hard Scrabble Ridge]
	Plummer Creek	(21) Black Ankle, (22) Cooper Cemetery, (23) Cooper Lane, (24) Hard Scrabble Ridge, (25) Koleen and (27) Plummer Creek 2 [near: (26) Plummer Creek 1]
	Mitchell Branch	(28) SR 45, (29) Mitchell Branch West, (30) Mitchell Branch, (31) Mitchell Branch East and (32) Indian Creek 1
	Little Indian Creek Monroe	(32) Indian Creek 1 [near: (31) Mitchell Branch East]
	Indian Creek South	(36) Indian Creek 3, (37) Indian Creek 5, (38) Indian Creek 4, (39) Rock East Road, and (40) Evans Lane [near: (34) Indian West and (35) Indian East]
	Indian Creek West	(36) Indian Creek 3, (37) Indian Creek 5, (38) Indian Creek 4 and (40) Evans Lane
	Indian Creek North	(38) Indian Creek 4 and (40) Evans Lane [near: (37) Indian Creek 5]
Section 5	Beanblossom East	(56) Whisnand, (57) Beanblossom Creek, (58) Long Pond, (59) Griffith, (60) Modesto and (61) Wylie [near: (54) Stout Valley, (55) Kinser Pike and (62) Canyon]
	Beanblossom West	(56) Whisnand, (57) Beanblossom Creek, (58) Long Pond, (59) Griffith, (60) Modesto, (61) Wylie and (62) Canyon [near: (55) Kinser Pike]
	Indian Creek Morgan	(63) Chambers Pike
	Bryant Creek South	(63) Chambers Pike, (64) Creek Road and (65) Cooksey

Sections	Northern Long-Eared Bat Maternity Colony	Mitigation Site [near = within ½ mile]
	Little Indian Monroe	(64) Creek Road and (65) Cooksey
	Bryant Creek North	(66) Paragon, (67) Bryant Creek, (68) Union and (69) Big Bend
	Jordan Creek	[near: (70) Little Indian Creek
	Little Indian Creek Morgan	(68) Union, (70) Little Indian Creek [near: (69) Big Bend and (71) Principal
	Lambs Creek	(72) Nutter Ditch

There were additional mitigation sites not proximate to the above northern long-eared bat maternity colonies. They were (9) Patoka – Meridian, (12) Veale Creek, (73) Ravinia Woods, (74) Berean Valley and (75) Waverly Bog. These properties are biologically attractive with many natural resources for the Indiana bat and other bats, including the northern long-eared bat. Section 6 mitigation efforts have not begun so there are no mitigation sites in Section 6 at this time.

Of the 38 northern long-eared bat maternity colonies, only 5 in Sections 1 through 5 do not have mitigation sites. In addition, four maternity colonies are in Section 6. A description of these maternity colonies without associated mitigation site(s) follows. In Section 3, there were four maternity colonies with no associated mitigation sites. They are the Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek and First Creek East maternity colonies. The first three maternity colonies are in highly agricultural lands (> 90%) with cleared stream banks as managed by conservancies, ditch and levee boards. Communications with Directors of the Prairie Creek Conservancy, Smothers (Dillion) and Vertrees drainages reported cleared banks and riparian areas cleared of trees. It is their drainage plan to maintain these streams treeless and remove and spray to maintain open waterways. There are a few large woodlots that offer habitat for the northern long-eared bat and other forest bats. There is a cleared buffer area between these woodlots and nearby streams. Thousand Acre woods is one such woodlot. It is a dedicated Nature Preserve (2001) as owned and managed by The Nature Conservancy.

Also in Section 3 is First Creek East maternity colony. It includes a mosaic of predominately agriculture, riparian corridors and forestland uses. This area is in a transition between the Wabash Lowland and Crawford Upland physiographic regions.

In Section 5, the Jordan Creek maternity colony does not have any associated mitigation site. It includes highly agricultural lands, but to the east is a contiguous block of forestland with a forest connected to the Morgan Monroe State Forest. Morgan Monroe State Forest is currently has thousands of acres of forest and is a State owned property. Much of this forest is mature.

Section 6 has Clear Creek East Fork, White River, White River – Goose Creek and Pleasant Run maternity colonies. No mitigation sites are present in Section 6 since FHWA and INDOT have not completed NEPA studies nor started mitigation in this section.

Summary of Sections

A synopsis of the bat survey capture results, northern long-eared bat capture frequency by site, and summary of the Indiana bat mitigation efforts by section is provided below.

Section 1

Section 1 is approximately 13 miles in length and included 407 bat captures of 8 species from 2004 to 2014 (9 years). The most common species were red bats (n=120, 29%), tri-colored bats (n=115, 28%), evening bats (n=98, 24%), and big brown bats (n=54, 13%), while uncommon were Indiana (n=10, 2%), northern long-eared (n=5, 1%), little brown (n=4, 1%), silver-haired (n=1, <1%) with no hoary bats.

There were 190 net nights from which 2 female and 3 male northern long-eared bats were captured during the 9 survey years for Section 1. Four of the 48 sites (10%) yielded northern long-eared bats over the entire survey period.

Two northern long-eared bat maternity colonies along Pigeon Creek were established in Section 1. They were Pigeon Creek South and Pigeon Creek North.

INDOT and FHWA purchased one mitigation site of approximately 161 acres along Pigeon Creek which included preservation of existing forests, reforestation and wetland/stream development within both of these maternity colonies.

Section 2

Section 2 is approximately 29 miles in length and included 806 bat captures of 8 species in 2004, 2005, 2010, 2011, 2012, 2013 and 2014 (7 years). The most common species were red bats (n=403, 50%), tri-colored bats (n=153, 19%), and big brown bats (n=112, 14%), while uncommon were northern long-eared bats (n=39, 5%), little brown bats (n=39, 5%), evening bats (n=31, 4%), Indiana bats (n=25, 3%), hoary bats (n=3, <1%) with no silver-haired bats. One bat is unknown since it escaped from the net before identification. A second bat was only identified as *Myostis sp.*

There were 349 net nights from which 22 female and 17 male northern long-eared bats were captured during the survey 7 years for Section 2. Twenty-two of the 90 sites (24%) yielded northern long-eared bats over the entire survey period.

Six northern long-eared bat maternity colonies were established in Section 2: Patoka South, Robinson South, Robinson North, Flat Creek, East Fork White River and Aikman Creek.

INDOT and FHWA has purchased 6 mitigation sites in the Patoka South maternity colony, 6 mitigation sites in the Robinson South maternity colony, 5 mitigation sites in or near Robinson North maternity colony, 4 mitigation sites in or near the Flat Creek maternity colony, 1 mitigation site in the East Fork of the White River maternity colony, and 2 mitigation sites in or near the Aikman Creek maternity colony. Section 2 has 1,043 acres of mitigation which includes preservation of existing forests, reforestation and wetland/stream development.

All of the 8 mitigation sites within the 4 northern long-eared bat maternity colonies along the Patoka River, Robinson Creek and Flat Creek equal 565 acres (54%) and have either been purchased by USFWS with help from INDOT/FHWA or are destined to go to the Patoka River National Wildlife Refuge as the land steward.

Section 3

Section 3 is approximately 25 miles in length and included 1,306 bat captures of 9 species in 2004, 2005, 2010, 2011, 2012, 2013 and 2014 (7 years). The most common species were little brown bats (n=419, 32%), big brown bats (n=292, 22%), evening bats (n=179, 14%), red bats (n=149, 11%), tri-colored bats (n=119, 9%), and northern long-eared bats (n=116, 9%), while uncommon were Indiana bats (n=23, 2%), hoary bats (n=3, < 1%) and silver-haired bats (n=2, <1%). Four bats are unknowns since they escaped from the net before identification.

There were 271 net nights from which 73 female and 38 male northern long-eared bats were captured during the 7 years of survey. Thirty-five of the 69 sites (51%) yielded northern long-eared bats over the entire survey period.

Eight maternity colonies were established in Section 3: Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek, White River – Weaver Ditch, White River – Fourmile Creek, First Creek West, First Creek East, and Doan's Creek West.

One-hundred eighteen visits to this from 2006 to 2011 identified 8,569 bats from five species. They were little brown (n=6,887, 80%), Indiana (n=878, 10%), big brown (n=774, 9%), tri-colored (n=29, < 1%) and two gray bats (< 1%). Indiana bats roost under this bridge during migration with mating in this species observed in late summer and early fall. No northern long-eared bats were observed under this bridge during the 6-8 years of surveys (Appendix B).

INDOT and FHWA purchased four mitigation sites in Section 3. They are Newberry, West Fork, South Newberry, and Doan's Creek. The Newberry mitigation site is approximately 355 acres along the West Fork White River which included preservation of existing forests, reforestation and wetland/stream development. This site is a short distance downstream of the bridge West Fork White River in Newberry. Many northern long-eared bats have been captured in the Newberry maternity colony along with the Indiana bat. They have also been found throughout the Naval Surface Warfare Center located at Crane. The northern long-eared bat is a forest bat and would be expected within the Crawford Upland physiographic region. The West Fork, Doan's Creek and South Newberry mitigation sites provide additional habitat for the northern long-eared bat and Indiana bat.

Section 4

Section 4 is approximately 27 miles in length and included 650 bat captures of 7 species in 2004, 2005, 2010, 2011, 2012, 2013, 2014 (7 years). The most common species were red bats (n=202, 3031 tri-colored bats (n=132, 20%), big brown bats (n=117, 18%), northern long-eared bats (n=85, 13%), and little brown bats (n=77, 12%), while uncommon were Indiana bats (n=16, 2%), hoary bats (n=11, 2%) with no evening or silver-haired bats. Ten bats are unknowns since they escaped from the net before identification.

There were 328 net nights from which 26 females and 57 male northern long-eared bats were captured in Section 4 during the 7 years of survey. Thirty-six of the 84 sites (43%) yielded northern long-eared bats over the entire survey period.

Nine northern long-eared bat maternity colonies were established in Section 4. They were Bogard Creek, Doan's Creek East, Black Ankle Creek, Plummer Creek, Mitchell Branch, Little Indian Creek Monroe, Indian Creek South, Indian Creek West, and Indian Creek North. Mitigation sites in Section 4 included Crane, Scotland, Dowden Ridge, Taylor Ridge, Black Ankle, Cooper Cemetery, Cooper Lane, Hard Scrabble Ridge, Koleen, Plummer Creek 1, Plummer Creek 2, SR 45, Mitchell Branch West, Mitchell Branch, Mitchell Branch East, Indian Creek 1, Indian Creek 2, Indian West, Indian East, Indian Creek 3, Indian Creek 5, Indian Creek 4, Rock East Road, Evans Lane, Newark, Beech Creek, Gardner Road, Richland Cemetery, Coon Hollow, Gardner South, Garrison Chapel, Eller, Tramway, and Clear Creek.

INDOT and FHWA has purchased 34 mitigation sites totaling 3,969 acres throughout the length of Section 4 which included preservation of existing forests, reforestation and wetland/stream development. In addition, INDOT and FHWA purchased mitigation sites not far from the West Fork White River where northern long-eared bats have been recorded. Last and very important, INDOT and FHWA purchased 4 Indiana bat hibernacula protecting approximately 32,000 Indiana bats or 7.5% of their 2011 range wide population of 424,708 or 14.4% of their 2011 Indiana population of 222,820, and are actively working with USFWS to improve conditions in another cave for greater circulation and lower temperatures that would be more conducive for use by Indiana bats and northern long-eared bats. These caves with the possible exception of are also known hibernacula for the northern long-eared bat.

Section 5

Section 5 is approximately 22 miles in length and included 626 bat captures of 9 species in 2004, 2005, 2012 and 2014 (4 years). The most common species were big brown bats (n=175, 28%), red bats (n=172, 27%), tri-colored bats (n=79, 12%), little brown bats (n=67, 11%), northern long-eared bats (n=67, 11%), while uncommon were Indiana bats (n=25, 4%), hoary bats (n=14, 2%), evening bats (n=13, 2%), , and silver-haired bats (n=13, 2%). One bat is unknown since it escaped from the net before identification.

There were 270 net nights from which 29 female and 38 male northern long-eared bats were captured during the 4 years of survey. Thirty of the 59 sites (51%) yielded northern long-eared bats over the entire survey period.

Nine maternity colonies were established in Section 5: Beanblossom West, Beanblossom East, Indian Creek Morgan, Bryant Creek South, Little Indiana Monroe, Bryant Creek North, Little Indian Creek Morgan, Jordan Creek, and Lambs Creek.

INDOT and FHWA currently have 25 mitigation sites totaling about 2,191 acres within the Lower East Fork, Lower White River and Upper White River watersheds. Mitigation sites include properties along Clear Creek in the Lower East Fork watershed, and tributaries of the West Fork of the White River.

Mitigation sites in Section 5 are Victor Pike, Richland Creek, Stout Creek, Stout Valley, Kinser Pike, Whisnand, Beanblossom Creek, Long Pond, Griffith, Modesto, Wylie, Canyon, Chambers Pike, Creek Road, Cooksey, Paragon, Bryant Creek, Union, Big Bend, Little Indian Creek, Principal, Nutter Ditch, Ravinia Woods, Berean Valley and Waverly Bog. These 25 mitigation sites include opportunities for preservation of existing forests, reforestation and wetland/stream development.

In addition, USFWS, INDOT and FHWA have agreed for Waverly Bog to be included with mitigation properties in Section 5 even though it is geographically located in Section 6.

Section 6

Section 6 is approximately 26 miles in length and included 323 bat captures of 7 species in 2004 and 2005 (2 years). The most common species were little brown bat (n=97, 30%), big brown bat (n=84, 26%), evening bat (n=43, 13%), tri-colored bat (n=32, 10%), northern long-eared bat (n=27, 8%), red bat (n=26, 8%), while uncommon were Indiana bat (n=13, 4%), with no hoary or silver-haired bats. One bat is an unknown since it escaped from the net before identification.

There were 140 net nights from which 11 female and 16 male northern long-eared bats were captured during the 2-year survey period in Section 6. Fifteen of the 36 sites (42%) yielded northern long-eared bats over the entire survey period.

Four northern long-eared bat maternity colonies were established in Section 6 in 2014 by USFWS (BFO). These maternity colonies in Section 6 were Clear Creek East Fork, White River, White River – Goose Creek and Pleasant Run.

In addition, the Indianapolis Airport Indiana bat maternity colony is 5-7 miles west of the proposed route of I-69 centered along the East Fork White Lick Creek as provided for reference.

Mining Records

At the 9 April 2014 meeting with USFWS (Appendix A), it was requested that FHWA and INDOT search records for the northern long-eared bats in mines. In response to this request, we investigated the use of mines within 5 miles of the I-69 project for Indiana bats and northern long-eared bats. We coordinated with the IDNR Division of Reclamation to obtain GIS data on mines that have had bat gates installed based on their bat occupancy data.

From the GIS data provided to us, we were able to identify four locations (some locations have more than one mine entrance) that occur within 5 miles of the I-69 right-of-way, all of which were in Pike County. We asked the IDNR Division of Reclamation to check their database records to see if they had any species specific information for each of these locations.

We received a return response from the IDNR Division of Reclamation on 29 May 2014. The data included records of northern long-eared bat at two of the mines, one associated with the Patoka River watershed and one associated with the East Fork White River. The East Fork White River also had records for the Indiana bat. The period of record for this data is 1996 to 1998, and included data from May, June, August, September and early October. There were no other data available. The individuals from the Patoka River were all male northern long-eared bats. Both males and females were captured during the September sampling at the East Fork White River site in 1998. This mine site is also near the existing East Fork White River maternity colony which includes the large Sandy Hook mitigation site. Additionally, the Horseshoe mitigation site within the Aikman Creek maternity colony is about of the mine location. Both of these northern long-eared bat maternity colonies showed male and female northern long-eared bats.

The IDNR Division of Reclamation indicated that their survey efforts no longer include attempts to determine species. Their surveys now focus on a bat presence/absence to determine if gates are warranted. Exhibit 1 includes the locations of these mines, and Appendix A includes IDNR data received from the Agency Coordination

The bulk of these data consists of males using these features in summer. It is not atypical for males to use caves or mines in summer. Males and non-reproductive females found at the mine in the East Fork White River watershed in September is also expected. From the Federal Register, Volume 78, No. 191 under the Summer Section (page 61054), “males and non-reproductive females’ summer roost sites may also include cooler locations, including caves and mines” (Barbour and Davis, 1969, p. 77; Amelon and Burhans 2006, p. 72).

Description and Results of 2004 to 2006 Fall/Winter/Spring Surveys for the Northern Long-Eared Bat

This chapter includes the following topics:

Introduction

In anticipation of "conferencing" between INDOT/FHWA and the USFWS, a summary of data specific to the northern long-eared bat has been prepared to highlight what is currently known about this species in the I-69 project (Exhibit 1, Exhibit 2 and Exhibit 3). The northern long-eared bat (*Myotis septentrionalis*) is expected to be listed as endangered by the U.S. Fish and Wildlife Service (USFWS).

During the Fall 2004, Winter 2004-05, Spring 2005, Fall 2005 and Winter 2005-06, 76 caves were surveyed for bats, including the northern long-eared bat, in the I-69 corridor. Exhibit 1 illustrates the level of effort invested in trapping and census cave surveys, and also shows distribution of sampling sites.

The purpose of this documentation is to summarize the effort and results of these fall, winter and spring bat surveys.

Fall/Winter/Spring Cave Surveys

In 2004, INDOT and FHWA developed a database of 330 caves along with 41 new caves and 2 railroad tunnels located within 5 miles of the I-69 corridor with the help of the Indiana Cave Survey, Indiana Karst Conservancy, Indiana Geological Survey, USFWS and expert bat biologists familiar with the bat biology in southwestern Indiana. These caves were reviewed by USFWS, biologists and bat/cave professionals for potential bat survey locations in I-69.

Two hundred and fifty (250) caves were selected for further field investigation based on their potential as bat hibernacula. Criteria used were: (1) a chimney air flow effect; (2) multiple cave openings; (3) a large volume that stores cool air; (4) constant winter air temperatures from 3° to 6° C; (5) previous records of bats in the database; and (6) the size and diversity needed as a hibernacula.

Based on field reviews on these 250 caves, INDOT and FHWA contracted to have 76 caves surveyed for Indiana bats in the fall, winter and spring of 2004-05 and 2005-06 (Figure 5). The surveys included either harp trapping the entrance of the cave in the fall or spring, and/or completing a winter census (i.e., an internal count of bats in the cave), and included species identification. Of the 76 caves, eleven did not show any bats of any species from the two winter censuses or any of the fall/spring harp trapping. Of the 65 caves where bats were noted/captured, northern long-eared bats were found in 50 (75%). Two-hundred and seventy-eight of a total 1,030 northern long-eared bats were from . Table 13 indicates the distance from northern long-eared bat hibernacula cave entrances to the I-69 right-of-way. Table 14 provides northern long-eared bat harp trapping capture data and winter cave survey northern long-eared bat count data.

Figure . WAA showing caves surveyed in 2004 through 2006 for bats.

Table 13 Distances From Northern Long-Eared Bat Hibernacula Entrances to I-69 R/W		
Hibernacula	**Distance to I-69 R/W (miles)**	**Nearest Section R/W**
	0.136	Section 4
	0.277	Section 4
	0.312	Section 4
	0.337	Section 4
	0.375	Section 5
	0.476	Section 4
	0.517	Section 4
	0.722	Section 4
	0.73	Section 5
	0.808	Section 4
	0.911	Section 4
	0.923	Section 4
	1.026	Section 4
	1.089	Section 4
	1.121	Section 4
	1.499	Section 5
	1.529	Section 4
	1.565	Section 4
	1.593	Section 4
	1.714	Section 5
	1.739	Section 4
	1.833	Section 4
	1.988	Section 4
	2.03	Section 5
	2.164	Section 4
	2.257	Section 4
	2.461	Section 4
	2.51	Section 4
	2.542	Section 4
	2.75	Section 5
	2.854	Section 5
	2.897	Section 4
	2.918	Section 4
	2.97	Section 4
	3.195	Section 5
	3.239	Section 4
	3.324	Section 4
	3.434	Section 4
	3.434	Section 4
	3.499	Section 4
	3.55	Section 4
	3.628	Section 4
	3.735	Section 4
	3.917	Section 5
	4.031	Section 4
	4.163	Section 4
	4.165	Section 4
	4.241	Section 4
	4.375	Section 5

Table 13 Distances From Northern Long-Eared Bat Hibernacula Entrances to I-69 R/W

Hibernacula	Distance to I-69 R/W (miles)	Nearest Section R/W
	4.491	Section 4
	4.496	Section 4
	4.677	Section 4
	4.719	Section 4
	4.883	Section 5
	4.887	Section 5

Table 14. Summary of Cave Data for the Northern Long-eared Bat

Cave	2004 Fall Harptrap	2004-05 Winter Census	2005 Spring Harptrap	2005 Fall Harptrap	2005-06 Winter Census	Cave Totals
	0	0	0	21	0	21
	3	0	0			3
	13	0				13
	78	0				78
	1	0				1
	10	0				10
	1	0				1
				1	0	1
				3	0	3
	3	0				3
	4	0				4
				8	0	8
	45	0				45
	27	0				27
	4	0				4
				9	0	9
				4	0	4
	23	0				23
	1	0				1
				4	0	4
	3	0				3
	3	0				3
	8	0				8
	0	0	3			3
				2	1	3
	2	0				2
	0	0	1			1
	55	0				55
				49	0	49
				61	0	61
	88	1	189			278
	3	0				3
	8	1				9
	1	1				2
	4	0				4

Table 14. Summary of Cave Data for the Northern Long-eared Bat

Cave	2004 Fall Harptrap	2004-05 Winter Census	2005 Spring Harptrap	2005 Fall Harptrap	2005-06 Winter Census	Cave Totals
	0	0				
				17	0	17
	2					2
	14		8			22
	45	0				45
	41	1		36	0	78
	5	0				5
	4	8				12
	9	0				9
		1				1
	11	0				11
				25	0	25
				16	0	16
	1	1				2
	35					35
	3	0				3
Total	558	14	201	256	1	1030

Northern long-eared bats have been reported from caves that also had Indiana bats in Greene, Monroe and Lawrence counties in Indiana (Table 15) indicating that both species will roost in the same caves. Nonetheless, the number of northern long-eared bats in these caves is unknown. This data comes from the USFWS which recognizes their presence, but had no specific numbers. Numbers for the northern long-eared bat are difficult to obtain due to their predisposition to roost in cracks that makes them difficult to observe during surveys.

Indiana bats have been recorded from 16 Indiana bat hibernacula in Greene, Monroe and Lawrence counties. The Tier 1 BA Addendum (March 7, 2006) shows 14 caves that support Indiana bats. Ten of these were previously known, while four were newly identified as part of the I-69 study:

The latter was identified by USFWS on the recommendation of the Indiana Karst Conservancy.

Table 15. List of Indiana bat hibernacula with northern long-eared bats in the I-69 WAA

	Cave	Indiana bat Population 2009	Northern long-eared bat Presence (No Date)
1	(Monroe County)	16,190	Yes
2	(Monroe County)	14,525	Yes
3	(Monroe County)	218	Yes
4	(Monroe County)	188	Yes
5	(Greene County)	61	Yes
6	(Lawrence County)	28	Yes
7	(Monroe County)	17	Yes
8	(Monroe County)	10	Yes
9	(Lawrence County)	9	Yes
10	(Greene County)	48,657	Yes
11	(Greene County)	828	Yes
Total		80,731	

INDOT and FHWA have purchased mitigation sites for shown in Table 3, and also that has Indiana bats, but we have no records for northern long-eared bats. These 4 caves protect approximately 32,000 Indiana bats or 7.5% of their 2011 range wide population of 424,708 or 14.4% of their 2011 Indiana population of 222,820 and certainly many northern long-eared bats too. We do not know the number of northern long-eared bats though since such surveys have not been completed for these major Indiana bat hibernacula. is outside the WAA for I-69 and is at the edge. We do not know of any subterranean connections between I-69 and .

Dye tracing studies were completed for many hibernacula and especially those listed in Table 15. These caves are located greater than 0.5 mile from the R/W for the Preferred Alternative. This fulfills the commitment made in the Tier 1 BA Addendum (March 7, 2006; pg. 11) that states "Alignment Planning – Efforts will be made to locate Interstate alignments beyond 0.5 miles from known Indiana bat hibernacula." From dye tracings, no impacts to these caves are known. However, we have found connections from the roadway to two northern long-eared bat hibernacula. They are is approximately 0.8 miles from I-69 and is approximately 0.4 miles from I-69. is located along the edge of SR 37 south of Bloomington. is in close proximity to the roadway and there is potential for impacts. In addition, lies down gradient from the roadway, and has no known hydrological connection to I-69, but there is a potential for impact. Additional caves within 0.5 miles of I-69 include .

In the winter of 2004-05 and 2005-06, a collective census (internal survey) of 73 caves was conducted to determine the species and number of bats utilizing these resources as hibernacula. A total of 3,117 bats representing five species were documented from this effort. Table 14 showed northern long-eared bats observed in eight caves. In addition, 49 caves showed northern long-eared bats harp trapped at their entrances. showed 4 northern long-eared bats harp trapped at its entrance, and showed 3 northern long-eared bats harp trapped at its entrance. All efforts will be made to protect the water quality and integrity of these two caves using the Karst MOU dated October 13, 1993.

In the fall of 2004 and 2005 and the spring of 2005, the entrances to 74 caves in Greene, Monroe and Lawrence counties were harp trapped to access bat usage. Two of the total 76 caves (were not surveyed via harp trap. Fifty-nine caves were harp trap surveyed in the fall of 2004 resulting in 1,800 bats; 9 caves were surveyed in the spring of 2005 resulting in 330 bats; and 16 caves were surveyed in the fall of 2005 resulting in 468 bats for a total of 2,598 bats.

Species found were the northern long-eared bat (n=1,015), little brown bat (n=955), tri-colored bat (n=607), Indiana bat (n=21) and big brown bat (n=5). Table 14 provides harp trap capture data for the northern long-eared bats at entrances. Northern long-eared bats were captured at 49 caves. Of the 5 species harp trapped at the entrance to the caves, the northern long-eared bat showed the greatest number.

Mitigation Sites

Considerable efforts have been completed by INDOT, FHWA, USFWS and consultants to find biologically attractive mitigation properties to compensate for the forest and wetland losses and stream impacts for I-69. INDOT and FHWA has purchased 50 mitigation properties totaling some 5,528 acres (8.6 square miles) in Sections 1-4. Twenty-five mitigation properties are currently being evaluated in Section 5 that equal at this time about 2,200 acres, or about 3.4

square miles. All of these mitigation sites provide opportunities for preservation of existing forests, reforestation and/or wetland/stream development which will protect existing and future winter and summer habitat (i.e., hibernacula, maternity roosts, foraging habitat and connecting travel corridors) for the Indiana bat and the northern long-eared bats. Because the preferred winter and summer habitat for the northern long-eared bat is generally similar to that for the Indiana bat, mitigation efforts proposed for the Indiana bat serve to provide similar habitat conservation/replacement for the northern long-eared bat as well.

In an effort to provide winter hibernacula mitigation for the Indiana bat, appropriate property owners were contacted for the purposes of securing mitigation sites that included known Indiana bats. In many instances, the northern long-eared bat has been found in the same caves as the Indiana bat. Therefore, winter hibernacula preservation and conservation measures conducted at these caves serve to benefit the northern long-eared bat. Below is the earlier commitment from INDOT and FHWA:

> Opportunities will be investigated to purchase at fair market value from "willing sellers" an Indiana bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and implementation of all management efforts, the hibernaculum(a) and all buffered areas will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. (Tier 1 BA Addendum, March 7, 2006; pg.17).

The above commitment benefits both the Indiana bat and the northern long-eared bat. For instance, FHWA and INDOT have purchased the following winter mitigation properties for the Indiana bat (Exhibit 3): (42) Newark; (43) Beech Creek; (44) Gardner Road; (45) Richland Cemetery; (46) Coon Hollow; (47) Garner South; (48) Garrison Chapel; (49) Eller; (50) Tramway; (51) Clear Creek; (52) Victor Pike;(53) Richland Creek. These purchases are also expected to benefit the northern long-eared bat. Descriptions for each of these mitigation sites follow.

The following mitigation sites were primarily associated with the Section 4 and 5 WAAs.

Section 4

(41) Newark –This mitigation site is not within any northern long-eared bat maternity colony. It is important since it will protect which is a known hibernacula for the northern long-eared bat and Indiana bat. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(42) Beech Creek –This mitigation site is not within any northern long-eared bat maternity colony. It is important since Beech Creek flows through it and provides habitat for the northern long-eared bat and the Indiana bat. This same Beech Creek flows close to which is one of the largest hibernacula for the Indiana bat and other bats, including the northern long-eared bat. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats.

(43) Gardner Road - This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect and buffer to the north. Both of these caves and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protecting many karst features and groundwater.

(44) Richland Cemetery – This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects and buffers from the south. Both of these caves and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(45) Coon Hollow – This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects . Both of these caves and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(46) <u>Gardner South</u> – This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect and buffer from the north. Both of these caves and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

(47) <u>Garrison Chapel</u> – This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects and the adjacent property that has . The latter two caves and have many northern long-eared bat too. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(48) <u>Eller</u> – This mitigation site is not within any northern long-eared bat maternity colony. It is important since it protects and potentially will lower its temperature inside so as to harbor Indiana bats and more northern long-eared bats. It is also very near and possibly connected to which is a known hibernacula for the Indian bat. is a known northern long-eared bat hibernacula. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(49) <u>Tramway</u> – This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from many hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and groundwater.

(50) Clear Creek – This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from many hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

Section 5

(51) Victor Pike – This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from many hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

(52) Richland Creek – This mitigation site is not within any northern long-eared bat maternity colony. It is important that it protect habitat for both the Indiana bat and the northern long-eared bat. Both species have been captured in the general area. It is also not far from some very important hibernacula for both species. With this mitigation site, habitat for the northern long-eared bat has been preserved and protected for both species to benefit. The mitigation site has excellent foraging habitat for both bats and protects many karst features and the groundwater.

Efforts to Purchase Bat Hibernacula

Efforts have been made to purchase hibernacula for bats in the I-69 project, especially for the Indiana bat. In working with the Indiana bat first and their known hibernacula, we contacted property owners. Of the 16 Indiana bat hibernacula within the project area, willing sellers for four of the cave properties (25%) have resulted in the purchase of properties that include

which collectively protect about 32,000 Indiana bats utilizing these hibernacula and the many northern long-eared bats too that use these caves. Six caves (37.5%) do not have “willing sellers”. They are

Three caves (18.8%) are currently protected by Federal, State or Local Agencies and/or Environmental Organizations: No response has been received from a letter sent to the property owner. The owners for have not been contacted as per conversations with USFWS and IDNR. Additionally, as an I-69 conservation measure, has had its entrance enlarged for greater circulation of air into the cave to lower the internal temperatures. INDOT/FHWA has also purchased which is on the same property with and two unnamed caves on a mitigation property very close to

The following descriptions provide additional information on Indiana bat hibernacula that are also northern long-eared bat hibernacula. Numbers of northern long-eared bats in these caves are unknown. To our knowledge, such formal surveys have not been completed for the northern long-eared bat.

(48,657 Indiana bats; northern long-eared bat present) – This cave includes the largest hibernacula for the Indiana bat within its geographic range. All efforts have been made through the USFWS to offer Fee Simple purchase or secure a Conservation Easement with the property owner. Similarly, we have contacted the owner for their interest. Both the property owners have declined fee simple and conservation easement protection of the resource. We also looked at the immediate area and contacted many property owners. No “willing sellers” have been forthcoming in the Ridgeport area.

(14,525 and 16,190 Indiana bats; northern long-eared bat present) – A conservation easement for these two caves as well as have been secured for the I-69 project.

The property is all forested with many large trees and many shagbark hickories. It is also connected to other mitigation properties that allow for 1,600 to 1,800 acres of contiguous forests. A conservation easement was obtained on this property as I-69 mitigation by INDOT/FHWA.

(828 Indiana bats; northern long-eared bat present) – A conservation easement for has been secured in the I-69 project, but excludes the existing house, structures and driveway. It is located in a large forested area of Greene County and has a spring fed small pond and lake on the property downhill of the cave. This cave is considered an ecological trap or sink, and a Conservation Management Plan is recommended to avoid or minimize the possibility of flooding. A conservation easement was obtained on this property as I-69 mitigation by INDOT/FHWA.

(218 Indiana bats; northern long-eared bat present) – This property owner has been contacted on a number of occasions and they are not interested in participating in the INDOT/FHWA Mitigation program. They own a large tract of land with many caves, including etc.

(188 Indiana bats; northern long-eared bat present) – This property owner has been contracted via a letter of interest, but no response has yet been received. The cave is Presently, there are mitigation properties south of the IDNR indicates that they have been working with the owner, but that they do not believe the owner is interested in mitigation opportunities.

(61 Indiana bats; northern long-eared bat present) – The property owner was contacted by letter and by phone, but the owners are not interested in participating in the INDOT/FHWA Mitigation Program.

(48 Indiana bats) – The property owners were contacted and with their passing, the daughter was also contacted. Conversations showed the family was not interested to sell land or enter into a Conservation Easement at this time. It is our understanding that the family will be moving to the homestead and that the cave will be protected from development. The property adjacent to the property includes which has also been acquired. Rocks from the entrance of have been moved as part of I-69 so as to improve air flow which should provide for cooler temperatures more conducive to the Indiana bat and northern long-eared bat. is a known hibernaculum for the northern long-eared bat.

(28 Indiana bats; northern long-eared bat present) – "Habitat conditions in are promising and these conditions may only minimally be affected by the present change in land use" (Tier 1 BA Addendum, March 7, 2006; pg. 90). This cave is located approximately from the I-69 corridor. The property owner has been contacted and they are not interested in participating in the INDOT/FHWA mitigation program.

(17 Indiana bats; northern long-eared bat present) – This property is located and includes forested habitat with rather large trees and The cave entrance is gated with a stream issuing forth. The cave is about 4.5 miles in length. The property owner was originally interested, but withdrew since he proposed to sell the land and cave.

(10 Indiana bats; northern long-eared bat present) – This cave has been used by cavers for many years. The has been managing the property and cave since 2005. Recently, the owner donated the property to the National Speleological Society (NSS) and it is now the but still managed by the RBNC.

(9 Indiana bats; northern long-eared bat present) - This property is owned by the Indiana Karst Conservancy (IKC). Indiana bats were found in this Lawrence County cave in 2003.

(2 Indiana Bats) – This cave showed 2 Indiana bats and for this reason, a fee simple purchase or a conservation easement has not been pursued for INDOT/FHWA mitigation.

(1 Indiana Bat, northern long-eared bat present) – This cave is located along It showed 1 Indiana bat and 3 northern long-eared bats and is considered a wet cave with flooding. This cave and are located on a mitigation property, but the portions of the property where the caves are located were removed by property owner from the mitigation area.

(1 Indiana bat in 1997) - INDOT/FHWA obtained a conservation easement for this cave and property as I-69 mitigation. This cave supported about 30 Indiana bats in 2010. It

is a wet cave found along a headwater intermittent stream within a mature quality forest. It is located within a contiguous tract of forestland of 1,600 to 1,800 acres.

(0 Indiana bats) – This property is owned by the Indiana Department of Natural Resources and has not supported Indiana bats since 1999. At that time (1999), 3 Indiana bats were observed. This property is very near to 6 mitigation properties east of the town of Koleen with a forest block preservation of 1,300 to 1,500 acres.

Summer Impact Analysis

This chapter includes the following topics:

Maternity Colony Analysis

The 38 Colonies

Based upon mist netting efforts during the summers of 2004 and 2005 and monitoring mist netting in 2008-2013 (8 years total effort), it was determined in consultation with USFWS that there are 38 northern long-eared bat maternity colony foraging areas within the I-69 SAA. A maternity colony consists of reproductively active female northern long-eared bats and their young. A maternity colony was determined to exist if there was evidence of reproduction in an area during the summer reproductive season (the capture of a reproductive female or juvenile). Each maternity colony foraging area is a circle with a 1.5-mile radius. The 1.5-mile distance was determined in consultation with USFWS. A 1.5-mile distance was also used to determine the width of the SAA by buffering the right-of-way for Sections 1 through 5 and the Representative Alignment for Section 6. Maternity colony foraging area circles were centered on mist net sites of northern long-eared bat capture or centroids from multiple mist net capture locations where such locations were in generally close proximity to each other. These 38 maternity colonies had not been identified earlier and were not included in the original Tier 1 BA in 2003 or the Tier 1 BA Addendum dated March 7, 2006. The 38 maternity colonies for the northern long-eared bat are shown on Exhibit 3 in this document (oversized map folded in plastic sleeve at end of document). These maternity colonies were developed by USFWS (BFO) using the best data available which included capture data (especially reproductive females and juveniles); following habitat descriptions in scientific publications; and use of existing maps (e.g., USGS, NWI, Soil Survey, aerials, etc.).

The 38 northern long-eared bat maternity colonies have been named after an associated river, stream or notable landscape feature. Because of their position in the landscape, several of the colonies overlap each other. Table 16 lists the 38 colonies by Section and indicates the percentage of area overlap with adjacent colonies.

Table 16 Colony Area Overlap Percentages for I-69 Northern Long-Eared Bat Colonies

Section	Colony	% Overlap	Overlap Colonies
Section 1	Pigeon Creek South	33%	Pigeon Creek North
	Pigeon Creek North	33%	Pigeon Creek South
Section 2	Patoka South Fork	46%	Robinson South, Robinson North, Flat Creek
	Robinson South	43%	Robinson North, Patoka South Fork, Flat Creek
	Robinson North	56%	Robinson South, Patoka South Fork, Flat Creek
	Flat Creek	48%	Robinson North, Patoka South Fork
	East Fork White River	22%	Aikman Creek
	Aikman Creek	22%	East Fork White River
Section 3	Thousand Acre Woods	0%	N/A
	North Fork Prairie Creek	0%	N/A
	Smothers Creek	0%	N/A
	White River - Weaver Ditch	41%	White River - Fourmile Creek
	White River - Fourmile Creek	50%	White River - Weaver Ditch, First Creek West
	First Creek West	10%	White River - Fourmile Creek, First Creek East
	First Creek East	2%	First Creek West
	Doans Creek West	13%	Bogard Creek
Section 4	Bogard Creek	30%	Doans Creek West, Doans Creek East
	Doans Creek East	43%	Bogard Creek, Black Ankle Creek
	Black Ankle Creek	32%	Doans Creek East, Plummer Creek
	Plummer Creek	6%	Black Ankle Creek
	Mitchell Branch	21%	Little Indian Creek Monroe
	Little Indian Creek Monroe	21%	Mitchell Branch
	Indian Creek South	55%	Indian Creek West, Indian Creek North
	Indian Creek West	75%	Indian Creek South, Indian Creek North
	Indian Creek North	44%	Indian Creek West, Indian Creek South
Section 5	Beanblossom East	47%	Beanblossom West
	Beanblossom West	47%	Beanblossom East
	Indian Creek Morgan	13%	Bryant Creek South
	Bryant Creek South	44%	Indian Creek Morgan, Little Indian Monroe
	Little Indian Monroe	36%	Jordan Creek, Bryant Creek
	Bryant Creek North	5%	Little Indian Creek Morgan
	Jordan Creek	4%	Little Indian Monroe
	Little Indian Creek Morgan	5%	Bryant Creek North
	Lambs Creek	0%	N/A
Section 6	Clear Creek East Fork	24%	White River
	White River	24%	Clear Creek East Fork
	White River - Goose Creek	0%	N/A
	Pleasant Run	0%	N/A

Maternity Colony Population Estimates

For the purposes of this study and using existing published data, USFWS considers all maternity colonies of the northern long-eared bat to be comprised of 50 reproductively active adult females and 50 pups. This would result in a maximum of 100 bats per colony once the young are volant. This assumption was recommended by USFWS Bloomington Field Office, and is based on documented maternity colony sizes throughout the northern long-eared bat's range. There were no roost tree data and thus no emergence counts to assist in developing the maternity population estimate.

Maternity Colony Foraging Area Analysis

Anticipated impacts to the 38 maternity colonies identified along the proposed I-69 corridor were analyzed. This included direct impacts, indirect impacts associated with the project and cumulative impacts from other sources. For the purposes of this document, the maternity colony analysis has been separated into three (3) sections: direct impacts, indirect and cumulative impacts, and total impacts. These impacts are summarized in the main text of this document and are shown in greater detail for each maternity colony in Appendix E.

Direct impacts (defined as direct transformation of land) for maternity colonies were not analyzed in Sections 1-3 since the highway has been constructed, and no new direct impacts will occur after the northern long-eared bat is listed. Similarly, direct impacts were not analyzed in Section 4, since tree clearing in this section has already occurred. Direct impacts to the 13 maternity colonies in Sections 5 and 6 were calculated because land transformation from construction is not complete or substantially underway. In Section 5, tree clearing has been completed from Bloomington up to the Beanblossom area or approximately the lower third of Section 5. Therefore, the analysis of forest loss within the SAA and the WAA does not include these prior cleared areas in the calculations. For the WAA analysis, forest loss was limited to a short length of the highway approximately 1.7 miles north of Beanblossom Creek Bridge on SR 37, where trees within the WAA have not yet been cleared. Section 5 includes 9 maternity colonies where impacts were calculated. Direct impacts are calculated for Section 6 in its entirety. Impacts are calculated for four maternity colonies in Section 6. Indirect and cumulative impact analysis were conducted on all sections throughout the project.

Direct Impacts

The direct impact analysis identifies the direct transformation of land from its current state to an interstate with its associated interchanges and access roads. Direct impacts will occur only in the foraging area for the 9 and 4 maternity colonies identified in Sections 5 and 6 respectively. Each maternity colony foraging area is about 4,524 acres (approximately 7.1 square miles). Because trees and forest are important to the northern long-eared bat for roosting, foraging, and flight corridors, the analysis will focus on that resource. Forest cover was used in the analysis, and was determined using 2011 NLCD and the EEAC Forest data. The NLCD information was derived from 30-meter resolution Landsat-based photography which has been categorized into 16 land cover classifications. From this source, four classes were used to define forest for the analysis (deciduous forest, evergreen forest, mixed forest and woody wetlands). The EEAC forest data involved mapping of forest resources within the I-69 corridor based on 2003 aerial photograph interpretation and on-site ground truthing. Groups of trees > 1 acre and wider than 120 feet wide were considered to constitute the minimum size for forest mapping purposes.

The current design right-of-way as of the spring of 2014 was used in the Section 5 analysis, while the Representative alignment was used in Section 6 for the direct impact analysis. A representative alignment is the footprint for the alternative, of those alternatives that are still under study. The representative alignments include the main line of the interstate, interchange locations, overpasses/underpasses, and local access roads (if developed).

The results of the maternity colony direct impact analysis are summarized in Table 17. Results are divided into three categories: No Build, which represents the current conditions within the maternity colony foraging area (based on 2003 aerial photographs and 2011 NLCD information); Build, which represents conditions after the construction of I-69; and the Loss, which represents the actual impacts resulting from the I-69 construction based on the design right-of-way (Section 5) and Representative Alignment (Section 6). All impacts in this analysis were rounded to the nearest whole number.

Foraging Area Forest Cover

The foraging area forest cover analysis calculates the total area of forest cover within each maternity colony foraging area, the percent of the total colony acreage that is forest cover, the area of forest core, the percent of total forest cover that is forest core, the area of forest cover edge (total forest cover minus forest core), and the percent of total forest cover that is forest cover edge.

Forest core is the interior portion of a tract of forest. Forest core area is generally accepted to be the portion of the forest that is 100 meters or more from any edge (Temple, 1986). Core impacts can occur from direct loss of the core, or by direct loss of the edge which redefines the forest core area. An area must be at least one acre to be defined as forest core area; this eliminates insignificant slivers as being considered forest core area. The remaining portion of forest which is not forest core area is considered forest edge area. Forest cover in highly developed urban and dense residential areas was not included in this analysis at the recommendation of the USFWS Bloomington Field Office, since northern long-eared bats appear to avoid these areas.

TOTAL FOREST COVER within each maternity colony for the No Build scenario ranged from 313 acres (7% of the colony area) for the Smothers Creek colony in Section 3 to 4,005 acres (89% of the total area) for the Little Indian Monroe colony in Section 4. **FOREST CORE AREA** for each maternity colony ranged from 30 acres (4% of all forest cover) for the White River – Goose Creek colony in Section 6 to 2,737 acres (68% of all forest cover) for the Little Indian Monroe colony in Section 4.

DIRECT FOREST COVER LOSS resulting from interstate construction ranged from 0 acres (28 maternity colonies in Sections 1 through 4 and 3 maternity colonies in Section 5)) to as high as 64 acres for the Bryant Creek South colony in Section 5. **FOREST COVER LOSS** ranged from 0 % to 1% of the forest cover within the maternity colony foraging areas. For the remainder of the forest clearing required in Sections 5 and 6, a collective estimated total of 486 acres of forest cover has yet to be cleared.

FOREST CORE LOSS included zero (0) acres in 29 of 38 maternity colonies; < 1 acre in four of 38 maternity colonies; and 4, 5, 5, 9 and 21 acres in the remaining 5 maternity colonies. The maternity colony with the highest core forest impacts (21 acres) is the Bryant Creek South colony. The remaining impacts were to the forest edge. The lack of core forest impacts reflects the significant efforts by INDOT and FHWA during I-69 planning to avoid impacting large forest tracks. For the remainder of the forest clearing required in Sections 5 and 6, a collective total of 38 acres of forest core area will be lost.

Forest Floodplain

Floodplain forests are often high quality habitat for bats. We frequently have identified the northern long-eared bat in such habitats where we also identified the Indiana bat. Forest cover within floodplains before and after the I-69 construction was analyzed. Floodplains were identified using Indiana Department of Natural Resources (IDNR) Digital Flood Insurance Rate Maps (DFIRM) data.

The area of forest floodplain cover before and after I-69 construction, as well as that directly impacted, is shown in Table 17. Total forest cover within the colony foraging area present in the 100-year floodplain as of spring 2014 ranged from 0 acres for the North Fork Prairie Creek, Smothers Creek, and Jordan Creek colonies to 1,447 acres for the Patoka South Fork colony. Direct impacts to forest cover in the floodplains ranged from 0 acres for the 32 of 38 maternity colonies (25 of which are in Sections 1 through 4 that are already constructed or cleared of forest); and <1, 1, 4, 4, 5 and 5 acres in the remaining six maternity colonies. There are five acres of impacts to Beanblossom East and Beanblossom West maternity colonies each, and four acres of impacts to Clear Creek East Fork and White River maternity colonies each. For the remainder of the forest clearing for Sections 5 and 6, a collective total of 15 acres of floodplain forest within the maternity colonies has yet to be cleared.

National Wetland Inventory (NWI) Wetlands and EEAC Wetland Data

Wetlands within the maternity colony foraging areas before and after I-69 construction were calculated using NWI (National Wetland Inventory) digital data outside of the corridor or those portions of the design right-of-way for Sections 1 through 5 that extend beyond the corridor, while wetland data within the corridor and right-of-way that extends beyond the corridor was used from that generated by the EEAC firms that investigated wetlands for the six Tier 2 Environmental Impact Statements. The NWI was developed by USFWS to provide information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats. Not all NWI wetlands meet the criteria necessary to be considered wetlands by the U.S. Army Corps of Engineers (USACE) guidelines. Conversely, not all wetlands within the landscape that meet the USACE guidelines are necessarily included in the NWI data.

NWI data is provided as a set of polygons, lines, and points. Riverine linear features and point features were excluded from the analysis. Forested (PFO), scrub/shrub (PSS), and emergent wetland (PEM) polygon areas within the maternity colonies were totaled for each wetland class. Open water areas (ponds and lakes) were also calculated, but not included in the wetland total. Ponds include those NWI features classified as PUB and PAB, while lakes include NWI features designated as lacustrine systems (L).

Wetland data provided by the EEACs from the EIS wetland investigations utilized the NWI naming conventions to categorized the wetlands encountered and subsequently delineated for each of the six Sections. This data was used to assess the amount of resource and loss of resource within the corridor portion of the colonies, SAA and WAA via GIS shape files generated by the EEACs.

Table 17 shows the total NWI/EEAC wetlands present in each colony for the No Build and Build conditions, as well as estimated NWI/EEAC wetland impacts for each colony. The **TOTAL WETLANDS** present within each maternity colony foraging area as of the spring of 2014 ranged from <1 and 1 acres for the Jordan Creek and Indian Creek Morgan colonies respectively in Section 5, to 1,564 acres for the Patoka South Fork colony. The majority of the wetlands in the maternity colony areas were forested. Direct wetland impacts ranged from 0 acres for 31 of the 38 maternity colonies (25 colonies in Sections 1 through 4 and six colonies in Sections 5 and 6); <1 acre for 4 of the 38 maternity colonies (Sections 5 and 6) ; and 2, 3 and 3 acres for Clear Creek East Fork (Sections 6), Beanblossom East and Beanblossom West maternity colonies (Section 5) respectively. The majority of NWI wetlands were forested wetlands.

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Pigeon Creek South	Pigeon Creek North	Patoka South Fork	Robinson South	Robinson North
I-69 Section	**Section 1**	**Section 1**	**Section 2**	**Section 2**	**Section 2**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	1,012	903	1,851	1,521	1,356
Total Forest Cover (% of landscape)	22%	20%	41%	34%	30%
Forest Core Area (acres)[2]	184	284	869	463	119
Forest Core Area (% of total forest)	18%	31%	47%	30%	9%
# of Forest Core Areas	6	4	6	12	12
Forest Edge Area (acres)[3]	828	619	982	1,059	1,238
Forest Edge Area (% of total forest)	82%	69%	53%	70%	91%
Build					
Total Forest Cover (acres)[1]	1,012	903	1,851	1,521	1,356
Total Forest Cover (% of landscape)	22%	20%	41%	34%	30%
Forest Core Area (acres)[2]	184	284	869	463	119
Forest Core Area (% of total forest)	18%	31%	47%	30%	9%
# of Forest Core Areas	6	4	6	12	12
Forest Edge Area (acres)[3]	828	619	982	1,059	1,238
Forest Edge Area (% of total forest)	82%	69%	53%	70%	91%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	0	0
Forest Edge Area (% change)	0%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	181	702	1447	1358	80
Build					
Total (acres)	181	702	1447	1358	80
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Pigeon Creek South	Pigeon Creek North	Patoka South Fork	Robinson South	Robinson North
I-69 Section	**Section 1**	**Section 1**	**Section 2**	**Section 2**	**Section 2**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	178	708	1564	1293	179
Forested (PFO (acres)	151	627	1139	1012	128
Scrub/Shrub (PSS) (acres)	27	72	230	248	37
Emergent (PEM) (acres)	<1	8	195	34	13
Ponds (PAB, PUB, PUS) (acres)	20	13	89	119	50
Lakes (L)	0	0	117	0	21
Build					
Total (acres)	178	708	1564	1293	179
Forested (PFO (acres)	151	627	1139	1012	128
Scrub/Shrub (PSS) (acres)	27	72	230	248	37
Emergent (PEM) (acres)	<1	8	195	34	13
Ponds (PAB, PUB, PUS) (acres)	20	13	89	119	50
Lakes (L)	0	0	117	0	21
Loss (Impacts)					
Total (acres)	0	0	0	0	0
Forested (PFO (acres)	0	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Flat Creek	East Fork White River	Aikman Creek	Thousand Acre Woods	North Fork Prairie Creek
I-69 Section	**Section 2**	**Section 2**	**Section 2**	**Section 3**	**Section 3**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	2,158	975	991	843	426
Total Forest Cover (% of landscape)	48%	22%	22%	19%	9%
Forest Core Area (acres)[2]	738	66	85	332	84
Forest Core Area (% of total forest)	34%	7%	9%	39%	20%
# of Forest Core Areas	13	5	8	5	5
Forest Edge Area (acres)[3]	1,421	909	906	512	341
Forest Edge Area (% of total forest)	66%	93%	91%	61%	80%
Build					
Total Forest Cover (acres)[1]	2,158	975	991	843	426
Total Forest Cover (% of landscape)	48%	22%	22%	19%	9%
Forest Core Area (acres)[2]	738	66	85	332	84
Forest Core Area (% of total forest)	34%	7%	9%	39%	20%
# of Forest Core Areas	13	5	8	5	5
Forest Edge Area (acres)[3]	1,421	909	906	512	341
Forest Edge Area (% of total forest)	66%	93%	91%	61%	80%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	0	0
Forest Edge Area (% change)	0%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	623	651	541	687	0
Build					
Total (acres)	623	651	541	687	0
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Flat Creek	East Fork White River	Aikman Creek	Thousand Acre Woods	North Fork Prairie Creek
I-69 Section	**Section 2**	**Section 2**	**Section 2**	**Section 3**	**Section 3**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	927	666	538	650	360
Forested (PFO (acres)	731	615	518	614	346
Scrub/Shrub (PSS) (acres)	183	15	2	3	9
Emergent (PEM) (acres)	13	36	17	32	5
Ponds (PAB, PUB, PUS) (acres)	44	47	12	2	4
Lakes (L)	5	0	0	0	0
Build					
Total (acres)	927	666	538	650	360
Forested (PFO (acres)	731	615	518	614	346
Scrub/Shrub (PSS) (acres)	183	15	2	3	9
Emergent (PEM) (acres)	13	36	17	32	5
Ponds (PAB, PUB, PUS) (acres)	44	47	12	2	4
Lakes (L)	5	0	0	0	0
Loss (Impacts)					
Total (acres)	0	0	0	0	0
Forested (PFO (acres)	0	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Smothers Creek	White River - Weaver Ditch	White River - Fourmile Creek	First Creek West	First Creek East
I-69 Section	**Section 3**	**Section 3**	**Section 3**	**Section 3**	**Section 3**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	313	687	682	895	1,868
Total Forest Cover (% of landscape)	7%	15%	15%	20%	41%
Forest Core Area (acres)[2]	54	45	35	63	443
Forest Core Area (% of total forest)	17%	7%	5%	7%	24%
# of Forest Core Areas	2	8	6	6	10
Forest Edge Area (acres)[3]	259	642	647	832	1,425
Forest Edge Area (% of total forest)	83%	93%	95%	93%	76%
Build					
Total Forest Cover (acres)[1]	313	687	682	895	1,868
Total Forest Cover (% of landscape)	7%	15%	15%	20%	41%
Forest Core Area (acres)[2]	54	45	35	63	443
Forest Core Area (% of total forest)	17%	7%	5%	7%	24%
# of Forest Core Areas	2	8	6	6	10
Forest Edge Area (acres)[3]	259	642	647	832	1,425
Forest Edge Area (% of total forest)	83%	93%	95%	93%	76%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	0	0
Forest Edge Area (% change)	0%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	0	658	656	287	91
Build					
Total (acres)	0	658	656	287	91
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Smothers Creek	White River - Weaver Ditch	White River - Fourmile Creek	First Creek West	First Creek East
I-69 Section	**Section 3**	**Section 3**	**Section 3**	**Section 3**	**Section 3**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	26	707	703	206	137
Forested (PFO (acres)	24	630	593	187	130
Scrub/Shrub (PSS) (acres)	2	23	31	0	0
Emergent (PEM) (acres)	0	54	80	18	7
Ponds (PAB, PUB, PUS) (acres)	70	62	28	42	10
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	26	707	703	206	137
Forested (PFO (acres)	24	630	593	187	130
Scrub/Shrub (PSS) (acres)	2	23	31	0	0
Emergent (PEM) (acres)	0	54	80	18	7
Ponds (PAB, PUB, PUS) (acres)	70	62	28	42	10
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	0	0	0	0	0
Forested (PFO (acres)	0	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Doans Creek West	Bogard Creek	Doans Creek East	Black Ankle Creek	Plummer Creek
I-69 Section	**Section 3**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	1,674	2,013	3,300	3,540	3,853
Total Forest Cover (% of landscape)	37%	45%	73%	78%	85%
Forest Core Area (acres)[2]	240	463	1,583	2,030	2,598
Forest Core Area (% of total forest)	14%	23%	48%	57%	67%
# of Forest Core Areas	18	18	12	7	4
Forest Edge Area (acres)[3]	1,434	1,550	1,717	1,510	1,255
Forest Edge Area (% of total forest)	86%	77%	52%	43%	33%
Build					
Total Forest Cover (acres)[1]	1,674	2,013	3,300	3,540	3,853
Total Forest Cover (% of landscape)	37%	45%	73%	78%	85%
Forest Core Area (acres)[2]	240	463	1,583	2,030	2,598
Forest Core Area (% of total forest)	14%	23%	48%	57%	67%
# of Forest Core Areas	18	18	12	7	4
Forest Edge Area (acres)[3]	1,434	1,550	1,717	1,510	1,255
Forest Edge Area (% of total forest)	86%	77%	52%	43%	33%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	0	0
Forest Edge Area (% change)	0%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	87	42	3	52	177
Build					
Total (acres)	87	42	3	52	177
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Doans Creek West	Bogard Creek	Doans Creek East	Black Ankle Creek	Plummer Creek
I-69 Section	**Section 3**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	84	48	8	2	100
Forested (PFO (acres)	81	48	8	2	97
Scrub/Shrub (PSS) (acres)	<1	0	0	0	1
Emergent (PEM) (acres)	3	<1	0	0	2
Ponds (PAB, PUB, PUS) (acres)	11	13	13	6	9
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	84	48	8	2	100
Forested (PFO (acres)	81	48	8	2	97
Scrub/Shrub (PSS) (acres)	<1	0	0	0	1
Emergent (PEM) (acres)	3	<1	0	0	2
Ponds (PAB, PUB, PUS) (acres)	11	13	13	6	9
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	0	0	0	0	0
Forested (PFO (acres)	0	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Mitchell Branch	Little Indian Creek Monroe	Indian Creek South	Indian Creek West	Indian Creek North
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	3,003	2,969	2,752	2,765	2,502
Total Forest Cover (% of landscape)	66%	66%	61%	61%	55%
Forest Core Area (acres)[2]	1,530	1,211	1,030	954	657
Forest Core Area (% of total forest)	51%	41%	37%	34%	26%
# of Forest Core Areas	12	13	19	19	22
Forest Edge Area (acres)[3]	1,473	1,758	1,722	1,812	1,844
Forest Edge Area (% of total forest)	49%	59%	63%	66%	74%
Build					
Total Forest Cover (acres)[1]	3,003	2,969	2,752	2,765	2,502
Total Forest Cover (% of landscape)	66%	66%	61%	61%	55%
Forest Core Area (acres)[2]	1,530	1,211	1,030	954	657
Forest Core Area (% of total forest)	51%	41%	37%	34%	26%
# of Forest Core Areas	12	13	19	19	22
Forest Edge Area (acres)[3]	1,473	1,758	1,722	1,812	1,844
Forest Edge Area (% of total forest)	49%	59%	63%	66%	74%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	0	0
Forest Edge Area (% change)	0%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	1	164	88	120	95
Build					
Total (acres)	1	164	88	120	95
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Mitchell Branch	Little Indian Creek Monroe	Indian Creek South	Indian Creek West	Indian Creek North
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	4	42	34	24	8
Forested (PFO (acres)	3	41	34	23	7
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	1	<1	<1	<1
Ponds (PAB, PUB, PUS) (acres)	5	4	15	13	11
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	4	42	34	24	8
Forested (PFO (acres)	3	41	34	23	7
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	1	<1	<1	<1
Ponds (PAB, PUB, PUS) (acres)	5	4	15	13	11
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	0	0	0	0	0
Forested (PFO (acres)	0	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Beanblossom East	Beanblossom West	Indian Creek Morgan	Bryant Creek South	Little Indian Monroe
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 5**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	2,267	2,229	3,905	3,998	4,005
Total Forest Cover (% of landscape)	50%	49%	86%	88%	89%
Forest Core Area (acres)[2]	371	364	2,251	2,571	2,737
Forest Core Area (% of total forest)	16%	16%	58%	64%	68%
# of Forest Core Areas	25	21	9	6	4
Forest Edge Area (acres)[3]	1,897	1,865	1,654	1,427	1,269
Forest Edge Area (% of total forest)	84%	84%	42%	36%	32%
Build					
Total Forest Cover (acres)[1]	2,241	2,204	3,863	3,934	3,998
Total Forest Cover (% of landscape)	50%	49%	85%	87%	88%
Forest Core Area (acres)[2]	371	364	2,251	2,571	2,737
Forest Core Area (% of total forest)	17%	16%	58%	65%	68%
# of Forest Core Areas	25	21	9	6	4
Forest Edge Area (acres)[3]	1,870	1,841	1,613	1,363	1,262
Forest Edge Area (% of total forest)	83%	84%	42%	35%	32%
Loss (Impacts)					
Total Forest Cover (acres)[1]	27	24	42	64	7
Total Forest Cover (% of landscape)	<-1%	<-1%	<-1%	-1%	<-1%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	<1%	<1%	<1%	1%	<1%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	27	24	42	64	7
Forest Edge Area (% change)	<-1%	<-1%	<-1%	-1%	<-1%
Forest Floodplain					
No Build					
Total (acres)	766	689	137	55	135
Build					
Total (acres)	760	683	137	55	135
Loss (Impacts)					
Total (acres)	5	5	0	0	0

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Beanblossom East	Beanblossom West	Indian Creek Morgan	Bryant Creek South	Little Indian Monroe
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 5**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	239	230	1	4	16
Forested (PFO (acres)	195	219	0	3	16
Scrub/Shrub (PSS) (acres)	35	5	0	<1	<1
Emergent (PEM) (acres)	8	6	1	0	0
Ponds (PAB, PUB, PUS) (acres)	38	30	10	19	19
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	236	227	1	3	16
Forested (PFO (acres)	194	218	0	3	16
Scrub/Shrub (PSS) (acres)	35	5	0	0	<1
Emergent (PEM) (acres)	6	4	1	0	0
Ponds (PAB, PUB, PUS) (acres)	38	30	10	19	19
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	3	3	0	<1	0
Forested (PFO (acres)	1	1	0	0	0
Scrub/Shrub (PSS) (acres)	<1	<1	0	<1	0
Emergent (PEM) (acres)	2	2	0	0	0
Ponds (PAB, PUB, PUS) (acres)	<1	<1	0	0	0
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Bryant Creek North	Jordan Creek	Little Indian Creek Morgan	Lambs Creek	Clear Creek East Fork
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 6**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	2,718	3,619	1,467	1,947	1,716
Total Forest Cover (% of landscape)	60%	80%	32%	43%	38%
Forest Core Area (acres)[2]	1,403	2,641	302	757	341
Forest Core Area (% of total forest)	52%	73%	21%	39%	20%
# of Forest Core Areas	6	4	12	8	12
Forest Edge Area (acres)[3]	1,316	978	1,165	1,191	1,375
Forest Edge Area (% of total forest)	48%	27%	79%	61%	80%
Build					
Total Forest Cover (acres)[1]	2,718	3,619	1,462	1,947	1,668
Total Forest Cover (% of landscape)	60%	80%	32%	43%	37%
Forest Core Area (acres)[2]	1,403	2,641	302	757	341
Forest Core Area (% of total forest)	52%	73%	21%	39%	20%
# of Forest Core Areas	6	4	12	8	11
Forest Edge Area (acres)[3]	1,316	978	1,160	1,191	1,327
Forest Edge Area (% of total forest)	48%	27%	79%	61%	80%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	5	0	48
Total Forest Cover (% of landscape)	0%	0%	<-1%	0%	-1%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	<1%	0%	<1%
Change in # of Forest Core Areas	0	0	0	0	-1
Forest Edge Area (acres)[3]	0	0	5	0	48
Forest Edge Area (% change)	0%	0%	<-1%	0%	<-1%
Forest Floodplain					
No Build					
Total (acres)	379	0	321	272	262
Build					
Total (acres)	379	0	321	272	258
Loss (Impacts)					
Total (acres)	0	0	0	0	4

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony				
	Bryant Creek North	Jordan Creek	Little Indian Creek Morgan	Lambs Creek	Clear Creek East Fork
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 6**
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**4,524**	**4,524**
Wetlands (NWI)					
No Build					
Total (acres)	266	<1	332	274	141
Forested (PFO (acres)	237	<1	272	143	107
Scrub/Shrub (PSS) (acres)	3	0	4	<1	4
Emergent (PEM) (acres)	26	0	56	131	30
Ponds (PAB, PUB, PUS) (acres)	13	11	6	36	147
Lakes (L)	0	0	0	0	8
Build					
Total (acres)	266	<1	332	274	139
Forested (PFO (acres)	237	<1	272	143	105
Scrub/Shrub (PSS) (acres)	3	0	4	<1	3
Emergent (PEM) (acres)	26	0	56	131	30
Ponds (PAB, PUB, PUS) (acres)	13	11	6	36	145
Lakes (L)	0	0	0	0	8
Loss (Impacts)					
Total (acres)	0	0	<1	0	2
Forested (PFO (acres)	0	0	0	0	2
Scrub/Shrub (PSS) (acres)	0	0	0	0	<1
Emergent (PEM) (acres)	0	0	<1	0	<1
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	3
Lakes (L)	0	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony			
	White River	White River - Goose Creek	Pleasant Run	Colony Composite
I-69 Section	**Section 6**	**Section 6**	**Section 6**	
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**148,790**
Foraging Area Forest Cover				
No Build				
Total Forest Cover (acres)[1]	884	787	1,028	64,982
Total Forest Cover (% of landscape)	20%	17%	23%	44%
Forest Core Area (acres)[2]	80	30	123	26,258
Forest Core Area (% of total forest)	9%	4%	12%	40%
# of Forest Core Areas	12	7	7	251
Forest Edge Area (acres)[3]	804	757	905	38,725
Forest Edge Area (% of total forest)	91%	96%	88%	60%
Build				
Total Forest Cover (acres)[1]	845	778	1,027	64,771
Total Forest Cover (% of landscape)	19%	17%	23%	44%
Forest Core Area (acres)[2]	80	30	123	26,220
Forest Core Area (% of total forest)	9%	4%	12%	40%
# of Forest Core Areas	11	7	7	249
Forest Edge Area (acres)[3]	765	747	904	38,551
Forest Edge Area (% of total forest)	91%	96%	88%	60%
Loss (Impacts)				
Total Forest Cover (acres)[1]	40	9	<1	211
Total Forest Cover (% of landscape)	<-1%	<-1%	<-1%	<-1%
Forest Core Area (acres)[2]	0	0	0	37
Forest Core Area (% change)	<1%	<1%	<1%	<1%
Change in # of Forest Core Areas	-1	0	0	-2
Forest Edge Area (acres)[3]	40	9	<1	174
Forest Edge Area (% change)	<-1%	<-1%	<-1%	<-1%
Forest Floodplain				
No Build				
Total (acres)	396	691	909	11726
Build				
Total (acres)	392	689	909	11711
Loss (Impacts)				
Total (acres)	4	1	<1	15

Table 17 Summary of I-69 Northern Long-eared Bat Maternity Colony Area Direct Impact Analysis

METRIC	Maternity Colony			
	White River	White River - Goose Creek	Pleasant Run	Colony Composite
I-69 Section	**Section 6**	**Section 6**	**Section 6**	
Landscape Area (acres)	**4,524**	**4,524**	**4,524**	**148,790**
Wetlands (NWI)				
No Build				
Total (acres)	441	437	217	10040
Forested (PFO (acres)	345	422	189	8437
Scrub/Shrub (PSS) (acres)	1	7	8	779
Emergent (PEM) (acres)	94	9	20	824
Ponds (PAB, PUB, PUS) (acres)	6	41	101	1049
Lakes (L)	0	33	18	199
Build				
Total (acres)	441	437	217	10033
Forested (PFO (acres)	345	422	189	8434
Scrub/Shrub (PSS) (acres)	1	7	8	778
Emergent (PEM) (acres)	94	9	20	821
Ponds (PAB, PUB, PUS) (acres)	6	41	101	1047
Lakes (L)	0	33	18	199
Loss (Impacts)				
Total (acres)	<1	0	<1	7
Forested (PFO (acres)	<1	0	<1	3
Scrub/Shrub (PSS) (acres)	<1	0	0	1
Emergent (PEM) (acres)	<1	0	0	3
Ponds (PAB, PUB, PUS) (acres)	<1	<1	0	3
Lakes (L)	0	0	0	0

[1] Tree Cover – defined as all trees, including individual, fragmented groups of trees

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all tree cover not included in a core > 1acre

Indirect and Cumulative Impacts

In addition to direct impacts in Sections 5 and 6, indirect and cumulative impacts were calculated for each maternity colony foraging area in Section 1-6. Indirect impacts are defined for the purposes of the Endangered Species Act (ESA) as those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. Cumulative impacts are defined for the purposes of the ESA as those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. This definition applies only to Section 7 analysis and should not be confused with the broader use of this term under the National Environmental Policy Act (NEPA).

For the indirect and cumulative impacts analysis, the Regional Economic Models, Inc. (REMI) model was used in Tier 1 to calculate the projected population and employment changes in each of five (5) economic zones within the I-69 study area for the year 2030. Growth for each region was allocated into Traffic Analysis Zones (TAZs). Changes in land use were calculated for both the No Build and the Build conditions. Population changes (i.e., number of new households) were converted to acreages by multiplying the number of households by a factor of 0.21 to 0.26 acres per household depending upon the region. The acres per household factors were determined by weighting the percentage of single-family dwelling units (3 units per acre) and multi-family dwelling units (7 units per acre) based on differing regional statistics. Employment changes were converted to acreages by multiplying the number of new employees by a factor of 0.05 to 0.065 acres per employee depending upon the region. These factors were developed for each region based on various housing and commercial/industrial development factors. The cumulative impacts are those forecasted to occur without the proposed I-69 construction (No-Build). The indirect impacts are those that would occur solely as a result of the I-69 construction (Build).

Expert land use panels reviewed the REMI model forecasted induced growth in population and employment and allocated these corresponding indirect growth impacts to TAZs based on their expectations of development. These panels consisted of developers, local city and county planning staff, and economic development personnel.

Indirect growth forecasted by the REMI model was allocated to appropriate TAZs. Forecasted growth for a TAZ within a maternity colony was translated into acreage to be converted into development as explained above. Growth within TAZs only partially in the colony foraging area was applied on an area percent basis. The percent of area developed in each TAZ was calculated. This percentage was applied to the total forest cover in each TAZ to determine the indirect and cumulative impacts. The remainder of the development was assumed to occur on agricultural land. For example, if the total area of a hypothetical TAZ was 100 acres and the estimated total development within the TAZ (as determined by the model and land use expert panel) was 10 acres, then development would be 10% of that TAZ. Forest cover impacts due to development would be estimated to be 10% of the total tree cover in that TAZ. If tree cover accounted for 50 acres within the 100-acre TAZ, five (5) acres of forest cover would be impacted due to development. Agricultural land is assumed to make up the difference between total impacts and forest cover impacts, thus five (5) acres of agricultural land would be impacted.

In addition to indirect impacts generated by the REMI model, impacts to forest cover from possible legal drain dredging were estimated and added to the model-based cumulative impacts. These impacts could potentially occur regardless of the I-69 construction. Legal drains are those streams legally maintained by the county or maintained through privately funded groups and were identified through coordination with county engineers or representative director of Drainage Boards, Ditches and Levees for the various counties. The cumulative impacts to forest cover associated with the maintenance (i.e., clearing of trees along streams) of legal drains was assessed by determining which legal drains support riparian tree habitat and estimating how much of it would likely be cleared in the next 20 years. Coordination with the county engineers and drainage board directors suggested that generally 1-2% of the legal drains have their forests cleared in 20 years. For this assessment a more liberal estimate of 5% clearing of forest cover along legal drains over the next 20 years was used to determine the legal drain maintenance forest loss component of the cumulative impact. This percentage was applied equally to all forest covered legal drains in each county. FHWA and INDOT concur that this approach is reasonable. Agricultural land impacts from legal drain maintenance were not included because they are temporary and land will likely remain in agricultural use. Legal drain maintenance impacts can be found in Appendix E, and listed as part of the Cumulative Impacts in Table 19.

In the Tier 1 FEIS Cumulative Impacts (Chapter 5.26), it was found that the long-term pattern in Indiana of forest loss which began at least in 1800 began to level off in 1950. Appendix G of the Tier 1 FEIS shows that based on USDA data, forested acreages in southwestern Indiana have increased or remained relatively constant from 1950 (1,904,000 acres) to 1998 (2,026,500). The 38 maternity colonies are located primarily in Gibson, Pike, Daviess, Greene, Monroe, Morgan, and Johnson counties. From 1950 to 2013, forest acreage within the I-69 counties (Gibson, Pike, Daviess, Greene, Monroe, Morgan and Johnson) gradually increased from 461,000 acres to 550,896 acres (Table 18). The most recent USDA Forest Service Data indicates that approximately 551,000 acres of forest land exists within the seven I-69 counties. Changing land management practices are contributing to this trend of increased forestation as some cropland and pasture are allowed to revert to forest and existing narrow wooded strips are allowed to expand. The increase in forested areas due to these changing practices have been greater than the losses from the conversion of forests to agriculture, urban/suburban expansion, and other uses in the past 50 years.

Table 18 Forest Land Acreages for Counties with Northern Long-Eared Bat Maternity Colonies (acres)

County	Year					
	1950	1967	1986	1998	2004	2013
Gibson	43,000	48,900	42,400	43,300	48,375	40,137
Pike	43,000	79,800	84,400	71,300	85,635	92,740
Daviess	41,000	41,900	42,100	27,400	23,215	33,172
Greene	101,000	99,800	106,200	128,000	118,221	110,388
Monroe	132,000	134,500	130,800	136,700	146,690	149,731
Morgan	84,000	92,000	88,200	83,900	90,962	102,419
Johnson	17,000	12,500	20,200	23,200	28,466	21,769
Total	461,000	509,400	514,300	513,800	514,564	550,896

Data Source: USDA Forest Service

It is important to note that in the indirect and cumulative analysis completed for this project, impacts to forests were determined by applying the percentage of expected development to the forest available in each TAZ. In practice, development is more likely to occur in agricultural areas, which are easier to develop. Also, much of the forest is located in floodplain and wetland areas, or areas of more severe terrain that are more costly to develop. It is also possible that induced growth in households and employment predicted by the REMI model could occur in areas already developed, such as existing housing additions or commercial and industrial parks. The analysis also does not factor in any reforestation (i.e., increase to the forest cover base) resulting from the I-69 mitigation. Nor does it account for reforestation anticipated in the region based on historic trends. Forest impacts as part of this analysis should be viewed as a "worst-case" scenario, which only presents potential gross losses without estimating gains in forest due to the factors cited here.

Table 19 summarizes the indirect, cumulative, and total indirect and cumulative impacts for each maternity colony foraging area. Indirect impacts are those that are predicted to occur as a result of the I-69 project. **TOTAL INDIRECT DEVELOPMENT** ranged from 0 acres for 14 of the 38 maternity colonies; less than 1-5 acres for 18 of the 38 maternity colonies; and 6, 7, 10, 13, 15 and 20 acres for Bogard Creek, Flat Creek, Mitchell Branch, Pigeon Creek South, Pleasant Run and Doan's Creek West colony foraging areas respectively. All estimated indirect development is less than <1% of the total colony foraging area. **INDIRECT FOREST COVER IMPACTS** ranged from 0 acres for 19 of 38 maternity colonies; 1 acre or less for 14 maternity colonies; and 2, 2, 3, 4 and 8 acres for Bogard Creek, Indian Creek West, Pleasant Run, Mitchell Branch, and Doan's Creek West maternity colonies respectively. All forest cover impacts resulting from indirect impacts were less than 1% of the total forest cover available within the individual foraging areas. Agricultural land impacts were assumed to make up the difference between the total indirect impacts and the forest cover impacts. **INDIRECT AGRICULTURAL LAND IMPACTS** ranged from 0 acres for 14 of the 38 maternity colonies; 1 or less acre for 11 of the 38 maternity colonies; 2-7 acres for 10 of the 38 maternity colonies; and 12, 12 and 13 acres for the Pleasant Run, Doan's Creek West and Pigeon Creek South maternity colonies respectively. Collectively, 24 acres of forest cover loss and 66 acres of agricultural land loss are estimated within the 148,790 acres that comprise the total northern long-eared bat maternity colonies.

Cumulative impacts are those that are anticipated to occur regardless of the I-69 project. For most colony foraging areas, the estimated cumulative impacts were larger than indirect impacts. Cumulative impacts also included legal drain maintenance for those colony foraging areas where legal drains were present. Legal drains occur in the following 15 northern long-eared bat maternity colonies in order from south to north: Pigeon Creek South, Pigeon Creek North, Patoka South Fork, Robinson South, Robinson North, Flat Creek, East Fork White River, Aikman Creek, Thousand Acres Woods, North Fork Prairie Creek, Smothers Creek, White River - Weaver Ditch, White River – Fourmile Creek, Lambs Creek and Pleasant Run. For these colonies, forest cover impacts from potential legal drain maintenance make up the majority of the cumulative impacts to forest cover. Collectively, 49 acres of forest cover loss is estimated due to legal drain maintenance over the next 20 years.

TOTAL CUMULATIVE IMPACTS ranged from 1 acre or less for the North Fork Prairie Creek, White River Weaver Ditch, White River Fourmile and Bryant Creek North maternity colonies; 2-30 acres for 27 of the 38 maternity colonies; and 30, 32, 36, 40, 42, 50 and 87 acres for the Flat Creek, Pigeon Creek South, White River, Clear Creek East Fork, Beanblossom East, Pleasant Run and White River – Goose Creek maternity colonies respectively. The Pleasant Run and White River – Goose Creek colonies are in the vicinity of Indianapolis near existing SR 37. All estimated cumulative development is 1% or less of the total colony area, except for White River – Goose Creek which showed 2%. Collectively, the total cumulative impacts for the composite maternity colony area is estimated at 527 acres. **CUMULATIVE FOREST COVER IMPACTS** due to cumulative development ranged from 0 acres for Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek, and White River – Weaver Ditch maternity colonies; <1-10 acres for 22 of the 38 maternity colonies; 11- 20 acres for 10 of the 38 maternity colonies; and 22 and 27 acres for Flat Creek and Beanblossom East maternity colonies respectively. All forest cover impacts resulting from cumulative impacts were less than or equal to 2% of the total forest cover available within the individual foraging areas. The majority were under 1%. Collectively, the cumulative forest cover impacts (legal drain forest loss and REMI model cumulative loss) for the composite maternity colony area is estimated at 213 acres.

TOTAL INDIRECT AND CUMULATIVE IMPACTS (not including direct impacts) ranged from 1 acre or less for the North Fork Prairie Creek, White River – Weaver Ditch, White River – Fourmile Creek and Bryant Creek North maternity colonies to 90 and 65 acres for the White River – Goose Creek and Pleasant Run maternity colonies respectively. All total indirect and cumulative impacts were less than 1% of the total colony area available except for the West Fork – Goose Creek maternity colony that showed 2 %. Collectively, the total indirect and cumulative impacts for the composite maternity colony areas is estimated at 617 acres. **TOTAL INDIRECT AND CUMULATIVE FOREST COVER IMPACTS** ranged from 0 acres for Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek, and White River – Weaver Ditch; 1 acre or less for Pigeon Creek South, White River – Fourmile Creek colony, First Creek East and Bryant Creek North maternity colonies; 2-10 acres for 16 of 38 maternity colonies; 11-20 acres for 12 of 38 maternity colonies; and 22 and 28 acres for Flat Creek and Beanblossom East maternity colonies respectively. All total indirect and cumulative forest cover impacts were less than 1% of the total forest cover available to the individual colony areas except for the White River Goose Creek maternity colony which was 2%. Collectively, the total indirect and cumulative forest cover impacts for the composite maternity colony areas is estimated at 237 acres. Total indirect and cumulative agricultural land impacts ranged from 1 acre or less for North Fork Prairie Creek, White River – Weaver Ditch, White River - Fourmile Creek and Bryant Creek North to as much as 43, 57 and 72 acres for Pigeon Creek South, Pleasant Run and Whiter River Goose Creek maternity colonies.

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Pigeon Creek South	Pigeon Creek North	Patoka South Fork	Robinson South	Robinson North
I-69 Section	**Section 1**	**Section 1**	**Section 2**	**Section 2**	**Section 2**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**1,012**	**903**	**1,851**	**1,521**	**1,356**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	45	17	20	18	26
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	1	4	15	15	20
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	1%
Agricultural Land (acres) [3]	43	13	5	3	7
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	32	15	20	18	22
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	1	4	15	15	20
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	1%
Agricultural Land (acres) [3]	31	11	5	3	3
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	13	2	0	0	4
Total Development (% of colony area)	<1%	<1%	0%	0%	<1%
Forest Cover Impact (acres) [2]	0	0	0	0	0
Forest Cover Impact (% of total forest cover)	0%	0%	0%	0%	0%
Agricultural Land (acres) [3]	13	2	0	0	4

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Flat Creek	East Fork White River	Aikman Creek	Thousand Acre Woods	North Fork Prairie Creek
I-69 Section	**Section 2**	**Section 2**	**Section 2**	**Section 3**	**Section 3**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**2,158**	**975**	**991**	**843**	**426**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	37	6	7	3	1
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	22	5	3	0	0
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	0%	0%
Agricultural Land (acres) [3]	15	2	4	3	1
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	30	6	7	2	1
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	22	5	3	0	0
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	0%	0%
Agricultural Land (acres) [3]	8	2	4	2	1
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	7	0	0	1	0
Total Development (% of colony area)	<1%	0%	0%	<1%	0%
Forest Cover Impact (acres) [2]	0	0	0	0	0
Forest Cover Impact (% of total forest cover)	0%	0%	0%	0%	0%
Agricultural Land (acres) [3]	7	0	0	1	0

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Smothers Creek	White River - Weaver Ditch	White River - Fourmile Creek	First Creek West	First Creek East
I-69 Section	**Section 3**	**Section 3**	**Section 3**	**Section 3**	**Section 3**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**313**	**687**	**682**	**895**	**1,868**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	2	<1	<1	5	5
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	0	0	<1	2	<1
Forest Cover Impact (% of total forest cover)	0%	0%	<1%	<1%	<1%
Agricultural Land (acres) [3]	2	<1	<1	3	5
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	2	<1	<1	5	5
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	0	0	<1	2	<1
Forest Cover Impact (% of total forest cover)	0%	0%	<1%	<1%	<1%
Agricultural Land (acres) [3]	2	<1	<1	3	5
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	0	0	0	0	<1
Total Development (% of colony area)	0%	0%	0%	0%	<1%
Forest Cover Impact (acres) [2]	0	0	0	0	<1
Forest Cover Impact (% of total forest cover)	0%	0%	0%	0%	<1%
Agricultural Land (acres) [3]	0	0	0	0	<1

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Doans Creek West	Bogard Creek	Doans Creek East	Black Ankle Creek	Plummer Creek
I-69 Section	**Section 3**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**1,674**	**2,013**	**3,300**	**3,540**	**3,853**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	27	9	4	4	4
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	10	3	2	2	2
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	17	5	3	2	2
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	7	3	4	3	3
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	2	1	2	1	1
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	5	2	2	2	2
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	20	6	<1	<1	1
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	8	2	<1	<1	<1
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	12	3	<1	<1	<1

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Mitchell Branch	Little Indian Creek Monroe	Indian Creek South	Indian Creek West	Indian Creek North
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**3,003**	**2,969**	**2,752**	**2,765**	**2,502**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	31	13	20	27	23
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	12	6	11	13	15
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	18	7	9	14	8
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	21	9	17	22	23
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	8	5	10	11	15
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	12	5	7	11	8
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	10	4	3	5	0
Total Development (% of colony area)	<1%	<1%	<1%	<1%	0%
Forest Cover Impact (acres) [2]	4	1	1	2	0
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	0%
Agricultural Land (acres) [3]	6	2	2	3	0

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Beanblossom East	Beanblossom West	Indian Creek Morgan	Bryant Creek South	Little Indian Monroe
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 5**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**2,267**	**2,229**	**3,905**	**3,998**	**4,005**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	44	26	25	10	7
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	28	17	16	7	4
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	15	9	9	4	3
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	42	25	25	10	7
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	27	16	16	7	4
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	15	9	9	4	3
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	2	1	0	0	<1
Total Development (% of colony area)	<1%	<1%	0%	0%	<1%
Forest Cover Impact (acres) [2]	1	<1	0	0	<1
Forest Cover Impact (% of total forest cover)	<1%	<1%	0%	0%	<1%
Agricultural Land (acres) [3]	<1	<1	0	0	<1

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony				
	Bryant Creek North	Jordan Creek	Little Indian Creek Morgan	Lambs Creek	Clear Creek East Fork
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 6**
Landscape Area (acres)	**4524**	**4524**	**4524**	**4524**	**4524**
Total Forest Cover (acres)	**2,718**	**3,619**	**1,467**	**1,947**	**1,716**
INDIRECT & CUMULATIVE[1] (2030 BUILD)					
Total Development (acres)	1	16	15	7	42
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	<1	6	6	3	18
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	1%
Agricultural Land (acres) [3]	<1	10	9	3	24
CUMULATIVE [1] (2030 NO BUILD)					
Total Development (acres)	1	14	12	7	40
Total Development (% of colony area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	<1	5	5	3	17
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	<1	8	7	3	23
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	0	2	2	0	2
Total Development (% of colony area)	0%	<1%	<1%	0%	<1%
Forest Cover Impact (acres) [2]	0	<1	<1	0	<1
Forest Cover Impact (% of total forest cover)	0%	<1%	<1%	0%	<1%
Agricultural Land (acres) [3]	0	1	2	0	1

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Table 19 Summary of I-69 Northern Long-eared Bat Maternity Colony Indirect and Cumulative Impact Analysis

METRIC	Maternity Colony			
	White River	White River - Goose Creek	Pleasant Run	Colony Composite
I-69 Section	**Section 6**	**Section 6**	**Section 6**	
Landscape Area (acres)	**4524**	**4524**	**4524**	**148,790**
Total Forest Cover (acres)	**884**	**787**	**1,028**	**64,982**
INDIRECT & CUMULATIVE[1] (2030 BUILD)				
Total Development (acres)	37	90	65	617
Total Development (% of colony area)	<1%	2%	1%	<1%
Forest Cover Impact (acres) [2]	11	17	8	237
Forest Cover Impact (% of total forest cover)	1%	2%	<1%	<1%
Agricultural Land (acres) [3]	26	72	57	380
CUMULATIVE [1] (2030 NO BUILD)				
Total Development (acres)	36	87	50	527
Total Development (% of colony area)	<1%	2%	1%	<1%
Forest Cover Impact (acres) [2]	11	17	6	213
Forest Cover Impact (% of total forest cover)	1%	2%	<1%	<1%
Agricultural Land (acres) [3]	25	70	45	314
INDIRECT (BUILD – NO BUILD)				
Total Development (acres)	2	3	15	90
Total Development (% of colony area)	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [2]	<1	<1	3	24
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%
Agricultural Land (acres) [3]	1	2	12	66

[1] Includes impacts from legal drain dredging and bank clearing.

[2] Determined based on a percentage of tree cover in the TAZ

[3] Assumed for this analysis to be (Total Impact – Forest Cover Impacts)

Total Impacts (Including Direct, Indirect and Cumulative)

Table 20 summarizes the total (including direct, indirect, and cumulative), forest cover impacts and NWI wetland impacts for each maternity colony.

TOTAL FOREST COVER IMPACTS (including direct, indirect, and cumulative) ranged from less than 1 acre for Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek, White River – Weaver Ditch, White River – Fourmile Creek, First Creek East and Bryant Creek North maternity colonies; 1-10 acre for 14 of 38 maternity colonies; 11-20 acre for 9 of 38 maternity colonies; 21-41 acre for 3 of 38 maternity colonies; and 50, 55, 58, 66 and 71 acres for White River, Beanblossom East, Indian Creek Morgan, Clear Creek East Fork and Bryant Creek South. Collectively, the total forest cover impact for the composite maternity colony area of 148,790 acres is estimated at 448 acres or 0.3%.

Total wetland impacts within the maternity colonies is limited to that of direct impacts resulting from construction of I-69, namely Sections 5 and 6 which have yet to be constructed. Total direct impacts ranged from 0 acres for 31 of the 38 maternity colonies; <1 acre for 4 of the 38 maternity colonies; and 2, 3 and 3 acres for Clear Creek East Fork, Beanblossom East and Beanblossom West maternity colonies respectively. Forested wetland impacts were generally one acre or less with the exception of Clear Creek East Fork (2 acres). Additional minor direct wetland acreage loss within Sections 5 and 6 would occur outside of the maternity colony areas in the Remaining SAA.

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Pigeon Creek South	Pigeon Creek North	Patoka South Fork	Robinson South	Robinson North
I-69 Section	**Section 1**	**Section 1**	**Section 2**	**Section 2**	**Section 2**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	0	0
Forest Cover Indirect Impacts (acres)	0	0	0	0	0
Forest Cover Cumulative Impacts (acres)	1	4	15	15	20
Forest Cover Total Impacts (acres)	1	4	15	15	20
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	0
Ponds (acres)	0	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Flat Creek	East Fork White River	Aikman Creek	Thousand Acre Woods	North Fork Prairie Creek
I-69 Section	**Section 2**	**Section 2**	**Section 2**	**Section 3**	**Section 3**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	0	0
Forest Cover Indirect Impacts (acres)	0	0	0	0	0
Forest Cover Cumulative Impacts (acres)	22	5	3	0	0
Forest Cover Total Impacts (acres)	22	5	3	0	0
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	0
Ponds (acres)	0	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Smothers Creek	White Rr - Weaver Ditch	White Rr - Fourmile Creek	First Creek West	First Creek East
I-69 Section	**Section 3**	**Section 3**	**Section 3**	**Section 3**	**Section 3**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	0	0
Forest Cover Indirect Impacts (acres)	0	0	0	0	<1
Forest Cover Cumulative Impacts (acres)	0	0	<1	2	<1
Forest Cover Total Impacts (acres)	0	0	<1	2	<1
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	0
Ponds (acres)	0	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Doans Creek West	Bogard Creek	Doans Creek East	Black Ankle Creek	Plummer Creek
I-69 Section	**Section 3**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	0	0
Forest Cover Indirect Impacts (acres)	8	2	<1	<1	<1
Forest Cover Cumulative Impacts (acres)	2	1	2	1	1
Forest Cover Total Impacts (acres)	10	3	2	2	2
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	0
Ponds (acres)	0	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Mitchell Branch	Little Indian Ck Monroe	Indian Creek South	Indian Creek West	Indian Creek North
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	0	0
Forest Cover Indirect Impacts (acres)	4	1	1	2	0
Forest Cover Cumulative Impacts (acres)	8	5	10	11	15
Forest Cover Total Impacts (acres)	12	6	11	13	15
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	0
Ponds (acres)	0	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Beanblossom East	Beanblossom West	Indian Creek Morgan	Bryant Creek South	Little Indian Monroe
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 5**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	27	24	42	64	7
Forest Cover Indirect Impacts (acres)	1	<1	0	0	<1
Forest Cover Cumulative Impacts (acres)	27	16	16	7	4
Forest Cover Total Impacts (acres)	55	41	58	71	11
NWI Wetlands[2]					
Forested (acres)	1	1	0	0	0
Scrub/Shrub (acres)	<1	<1	0	<1	0
Emergent (acres)	2	2	0	0	0
Ponds (acres)	<1	<1	0	0	0
Lakes (acres)	0	0	0	0	0
Total	3	3	0	<1	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY				
	Bryant Creek North	Jordan Creek	Little Indian Ck Morgan	Lambs Creek	Clear Creek East Fork
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 5**	**Section 6**
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	5	0	48
Forest Cover Indirect Impacts (acres)	0	<1	<1	0	<1
Forest Cover Cumulative Impacts (acres)	<1	5	5	3	17
Forest Cover Total Impacts (acres)	<1	6	11	3	66
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	2
Scrub/Shrub (acres)	0	0	0	0	<1
Emergent (acres)	0	0	<1	0	<1
Ponds (acres)	0	0	0	0	3
Lakes (acres)	0	0	0	0	0
Total	0	0	<1	0	2

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 20 Summary of I-69 Northern Long-Eared Bat Maternity Colony Impact Analysis

METRIC	MATERNITY COLONY			
	White River	White River - Goose Creek	Pleasant Run	Colony Composite
I-69 Section	**Section 6**	**Section 6**	**Section 6**	
Forest Cover[1]				
Forest Cover Direct Impacts (acres)	40	9	<1	211
Forest Cover Indirect Impacts (acres)	<1	<1	3	24
Forest Cover Cumulative Impacts (acres)	11	17	6	213
Forest Cover Total Impacts (acres)	50	26	9	448
NWI Wetlands[2]				
Forested (acres)	<1	0	<1	3
Scrub/Shrub (acres)	<1	0	0	1
Emergent (acres)	<1	0	0	3
Ponds (acres)	<1	<1	0	3
Lakes (acres)	0	0	0	0
Total	<1	0	<1	7

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

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Remaining SAA

This chapter includes the following topics:

Introduction

The area within the SAA, yet outside of the maternity colony foraging areas, is referred to in this document as the Remaining SAA. This area was analyzed to account for impacts to more solitary northern long-eared bats such as males and non-reproductive females. This analysis included total forest and forest core in the Remaining SAA, forest and forest core directly impacted, as well as wetland resources directly within the Remaining SAA. Additionally, this analysis included indirect and cumulative impacts to forest resources throughout the I-69 corridor. As with the maternity colony analysis, forest resources utilized included forest cover determined by the EEACs within the I-69 corridor and those areas within the design right-of-way that extend beyond the I-69 corridor, and 2011 NLCD forest and woody wetland class data for those areas beyond the I-69 corridor.

Direct Impact

Table 21 summarizes the results of the Remaining SAA analysis for each Tier 2 Section. The total forest in the Remaining SAA prior to I-69 construction ranged from 4,729 acres in Section 3 to 44,618 acres in Section 4. This includes both wetland and non-wetland forest. Approximately 119,494 acres of forest is estimated to be present within the entire Remaining SAA (Sections 1 through 6). Forest cover generally comprises a smaller percentage of the Remaining SAA in Sections 1, 2, 3 and 6 (14 to 23 percent), where the topography is more conducive to farming and suburban development, and greater in Sections 4 and 5 (43 to 68 percent) where the topography is hilly and less conducive to large scale agriculture and development Forest in the Remaining SAA directly impacted by the project ranged from 0 acres in Sections 1 – 4 to 56 acres in Section 5 and 219 acres in Section 6 for a total of 275 acres.

Forest core area within the Remaining SAA ranges from 787 acres in Section 3 to 21,596 acres in Section 4. Forest core area loss is 0 acres for Sections 1 through 4 and 12 and 6 acres in Sections 5 and 6 respectively for a total of 18 acres.

The wetland analysis for the Remaining SAA of Sections 5 and 6 was conducted using the most current EEAC wetland data collected for the right-of-way and NWI data elsewhere. For Section 6, wetland impact estimates presented here for the Representative Alignment will likely differ when a more comprehensive and accurate survey of wetlands is conducted and a design right-of-way has been developed. The total wetlands in the Remaining SAA as of the spring of 2014 (i.e., Sections 1 through 4 completed, Sections 5 and 6 not yet constructed) ranged from 206 acres in Section 5 to 3,524 acres in Section 1. Approximately 9,683 acres of wetlands are estimated to be present within the entire Remaining SAA.

Direct wetlands impacts anticipated for the Remaining SAA for Sections 1 through 4 are 0 acres; Sections 5 and 6 are estimated at <1 acre and 3 acres respectively. As with the maternity colony evaluation of direct wetland loss, no impacts for Sections 1 through 4 are documented here since this portion of the project has been completed or is currently under construction. A total of 4 acres of wetlands are expected to be directly impacted by the project within the Remaining SAA, approximately half of which are forested wetlands. Wetland totals do not include ponds and lakes.

Table 21 Summary of Northern Long-Eared Bat Remaining SAA[1] Direct Impacts			
	Section 1	**Section 2**	**Section 3**
Remaining SAA Acreage	60,210	46,550	34,222
Forest			
Build			
Total Forest Cover (acres)[1]	13716	9745	4729
Total Forest Cover (% of landscape)	23%	21%	14%
Forest Core Area (acres)[2]	4310	998	787
Forest Core Area (% of total forest)	7%	2%	2%
Forest Edge Area (acres)[3]	9405	8747	3942
Forest Edge Area (% of total forest)	16%	19%	12%
No-Build			
Total Forest Cover (acres)[1]	13716	9745	4729
Total Forest Cover (% of landscape)	23%	21%	14%
Forest Core Area (acres)[2]	4310	998	787
Forest Core Area (% of total forest)	7%	2%	2%
Forest Edge Area (acres)[3]	9405	8747	3942
Forest Edge Area (% of total forest)	16%	19%	12%
Loss (Impacts)			
Total Forest Cover (acres)[1]	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0
Forest Core Area (% change)	0%	0%	0%
Forest Edge Area (acres)[3]	0	0	0
Forest Edge Area (% change)	0%	0%	0%
Wetlands			
No Build			
Total (acres)[3]	3524	1654	853
Forested (acres)	2917	1360	673
Scrub/Shrub (acres)	348	145	42
Emergent (acres)	260	149	137
Ponds (acres)	737	404	134
Lakes (acres)	223	215	57
Build			
Total (acres)[3]	3524	1654	853
Forested (acres)	2917	1360	673
Scrub/Shrub (acres)	348	145	42
Emergent (acres)	260	149	137
Ponds (acres)	737	404	134
Lakes (acres)	223	215	57
Loss (Impacts)			
Total (acres)[3]	0	0	0
Forested (acres)	0	0	0
Scrub/Shrub (acres)	0	0	0
Emergent (acres)	0	0	0
Ponds (acres)	0	0	0
Lakes (acres)	0	0	0

[1] Remaining SAA includes any portion of the SAA outside the maternity colony foraging areas

[2] Based on 2011 NLCD tree cover minus forest cover that has been cleared in Sections 1 through 4 and forest cover cleared in Section 5 as of the spring of 2014.

[3] Wetland totals do not include ponds and lakes

Table 21 Summary of Northern Long-Eared Bat Remaining SAA[1] Direct Impacts				
	Section 4	**Section 5**	**Section 6**	**Remaining SAA**
Remaining SAA Acreage	65,197	26,970	203,134	436,284
Forest				
Build				
Total Forest Cover (acres)[1]	44618	11612	34800	119219
Total Forest Cover (% of landscape)	68%	43%	17%	27%
Forest Core Area (acres)[2]	21599	3021	6916	37631
Forest Core Area (% of total forest)	33%	11%	3%	9%
Forest Edge Area (acres)[3]	23019	8591	27884	81588
Forest Edge Area (% of total forest)	35%	32%	14%	19%
No-Build				
Total Forest Cover (acres)[1]	44618	11669	35018	119494
Total Forest Cover (% of landscape)	68%	43%	17%	27%
Forest Core Area (acres)[2]	21599	3034	6921	37649
Forest Core Area (% of total forest)	33%	11%	3%	9%
Forest Edge Area (acres)[3]	23019	8635	28097	81845
Forest Edge Area (% of total forest)	35%	32%	14%	19%
Loss (Impacts)				
Total Forest Cover (acres)[1]	0	56	219	275
Total Forest Cover (% of landscape)	0%	<1%	<1%	<1%
Forest Core Area (acres)[2]	0	12	6	18
Forest Core Area (% change)	0%	<1%	<1%	<1%
Forest Edge Area (acres)[3]	0	44	213	257
Forest Edge Area (% change)	0%	<1%	<1%	<1%
Wetlands				
No Build				
Total (acres)[3]	348	206	3098	9683
Forested (acres)	325	168	2749	8192
Scrub/Shrub (acres)	6	15	54	611
Emergent (acres)	16	23	294	879
Ponds (acres)	194	75	1366	2910
Lakes (acres)	0	31	645	1172
Build				
Total (acres)[3]	348	205	3094	9678
Forested (acres)	325	168	2747	8190
Scrub/Shrub (acres)	6	15	54	611
Emergent (acres)	16	22	293	878
Ponds (acres)	194	75	1328	2871
Lakes (acres)	0	31	645	1172
Loss (Impacts)				
Total (acres)[3]	0	<1	3	4
Forested (acres)	0	<1	2	2
Scrub/Shrub (acres)	0	<1	<1	<1
Emergent (acres)	0	<1	1	2
Ponds (acres)	0	<1	38	38
Lakes (acres)	0	0	0	0

[1] Remaining SAA includes any portion of the SAA outside the maternity colony foraging areas
[2] Based on 2011 NLCD tree cover minus forest cover that has been cleared in Sections 1 through 4 and forest cover cleared in Section 5 as of the spring of 2014.
[3] Wetland totals do not include ponds and lakes

Indirect and Cumulative Impacts

In addition to direct impacts, indirect and cumulative impacts were calculated for each Remaining SAA section. Refer to the Indirect and Cumulative Impacts discussion for the maternity colonies for an explanation on how the analysis was performed.

Table 22 summarizes the indirect, cumulative, and total indirect and cumulative impacts for the six Remaining SAA sections analyzed. Indirect impacts are those that are predicted to occur as a result of the I-69 project. **Total indirect development** (including both forest and agricultural land) for the entire Remaining SAA was estimated at 709 acres or <1%. Total indirect development ranged from 63 acres for the Section 3 Remaining SAA foraging area to 250 acres for Section 1. Of the total 709 acres of impacts from indirect development, total agricultural land impacts made up 586 acres (83%), while forest cover impacts made up 123 acres (17%) in the Remaining SAA.

Forest cover impacts resulting from indirect development for the entire Remaining SAA were estimated at 123 acres or <1% of the total forest cover available in the area. Forest cover impacts ranged from 0 acres in Section 2 to 60 acres in Section 5. All forest cover impacts resulting from indirect impacts were 0 or <1% of the total forest cover available. Approximately 586 acres of agricultural land is estimated to be indirectly impacted by the I-69 project in the Remaining SAA. Indirect agricultural land impacts ranged from 33 acres in Section 5 to 247 acres in Section 1.

Cumulative impacts are those that are believed to occur regardless of the I-69 project. For all Remaining SAA, estimated cumulative impacts were larger than indirect impacts. **Total cumulative development** (including both forest and agricultural land) for the entire Remaining SAA was estimated at 9,554 acres or 2% of the entire area. Total cumulative development ranged from 38 acres in Section 3 to 6,081 acres in Section 6. The estimated cumulative development ranged from <1% to 7%.

Forest cover impacts resulting from cumulative development for the entire Remaining SAA were estimated at 2,568 acres or 2% of the total forest cover available. Forest cover impacts ranged from 2 acres in Section 3 to 1,216 acres in Section 6. All forest cover impacts resulting from cumulative impacts ranged from <1% to 10% of the total forest cover available. Approximately 6,986 acres of agricultural land is estimated to be impacted by cumulative development. Cumulative agricultural land impacts ranged from 36 acres in Section 3 to 4,865 acres in Section 6.

Total indirect and cumulative impacts (not including direct impacts) for the entire Remaining SAA are estimated at 10,263 acres or 2% of the total area. Total indirect and cumulative impacts corresponded closely with cumulative impacts since cumulative impacts made up the majority of the total. Total indirect and cumulative impacts ranged from 100 acres in Section 3 to 6,223 in Section 6. All total indirect and cumulative impacts ranged from <1% to 7%.

Total indirect and cumulative forest cover impacts in the entire Remaining SAA were estimated at 2,691 acres or 2% of the total forest cover available. Total indirect and cumulative forest cover impacts ranged from 2 acres in Section 3 to 1,250 acres in Section 6. All total indirect and cumulative forest cover impacts ranged from <1% to 10% of the total forest cover available. A total of 7,573 acres of agricultural land is estimated to be impacted in the Remaining SAA. Total indirect and cumulative agricultural land impacts ranged from 98 acres in Section 3 to 4,972 acres in Section 6.

Table 22 Summary of I-69 Northern Long-eared Bat Remaining SAA Indirect and Cumulative Impact Analysis

METRIC	Remaining Summer Action Area		
	Section 1	Section 2	Section 3
Landscape Area (acres)	**60,210**	**46,550**	**34,222**
Total Forest Cover (acres)	**13,716**	**9,745**	**4,729**
INDIRECT & CUMULATIVE (2030 BUILD)			
Total Development (acres)	1359	273	100
Total Development (% of RSAA foraging area)	2%	<1%	<1%
Forest Cover Impact (acres) [1]	32	11	2
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%
Agricultural Land Impact (acres)	1328	262	98
CUMULATIVE [1] (2030 NO BUILD)			
Total Development (acres)	1109	190	38
Total Development (% of RSAA foraging area)	2%	<1%	<1%
Forest Cover Impact (acres) [1]	29	11	2
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%
Agricultural Land Impact (acres)	1080	179	36
INDIRECT (BUILD – NO BUILD)			
Total Development (acres)	250	83	63
Total Development (% of RSAA foraging area)	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	3	0	<1
Forest Cover Impact (% of total forest cover)	<1%	0%	<1%
Agricultural Land Impact (acres)	247	83	62

[1] Determined based on a percentage of tree cover in the TAZ

Table 22 Summary of I-69 Northern Long-eared Bat Remaining SAA Indirect and Cumulative Impact Analysis

METRIC	Remaining Summer Action Area			
	Section 4	Section 5	Section 6	Remaining SAA
Landscape Area (acres)	**65,197**	**26,970**	**203,134**	**436,284**
Total Forest Cover (acres)	**44,618**	**11,669**	**35,018**	**119,494**
INDIRECT & CUMULATIVE (2030 BUILD)				
Total Development (acres)	418	1891	6223	10263
Total Development (% of RSAA foraging area)	<1%	7%	3%	2%
Forest Cover Impact (acres) [1]	196	1199	1250	2691
Forest Cover Impact (% of total forest cover)	<1%	10%	4%	2%
Agricultural Land Impact (acres)	221	691	4972	7573
CUMULATIVE [1] (2030 NO BUILD)				
Total Development (acres)	337	1798	6081	9554
Total Development (% of RSAA foraging area)	<1%	7%	3%	2%
Forest Cover Impact (acres) [1]	170	1140	1216	2568
Forest Cover Impact (% of total forest cover)	<1%	10%	3%	2%
Agricultural Land Impact (acres)	167	659	4865	6986
INDIRECT (BUILD – NO BUILD)				
Total Development (acres)	80	92	141	709
Total Development (% of RSAA foraging area)	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	26	60	34	123
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	54	33	107	586

[1] Determined based on a percentage of tree cover in the TAZ

Total Impacts (Including Direct, Indirect and Cumulative)

Table 23 summarizes the total forest cover impacts (including direct, indirect and cumulative) and NWI wetland impacts for each Remaining SAA foraging area.

Total forest cover impacts, including direct, indirect, and cumulative, for the entire Remaining SAA were 2,966 acres. Total forest cover impacts for each section ranged from 2 acres for Section 3 to 1,469 acres for Section 6. The majority of the total impacts anticipated are associated with cumulative development. Direct development made up a relatively small percentage (approximately 9%) of the total forest cover impacts since Sections 1 through 4 have already been cleared. Indirect impacts are estimated to be just over 4% of the total forest cover impact.

Total NWI wetland impacts anticipated in the Remaining SAA (excluding ponds and lakes) are estimated at approximately 4 acres for the entire project.

Table 23 Summary of I-69 Northern Long-Eared Bat Maternity Remaining SAA Impacts

METRIC	Remaining SAA		
I-69 Section	**Section 1**	**Section 2**	**Section 3**
Forest Cover[1]			
Forest Cover Direct Impacts (acres)	0	0	0
Forest Cover Indirect Impacts (acres)	3	0	<1
Forest Cover Cumulative Impacts (acres)	29	11	2
Forest Cover Total Impacts (acres)	32	11	2
NWI Wetlands[2]			
Forested (acres)	0	0	0
Scrub/Shrub (acres)	0	0	0
Emergent (acres)	0	0	0
Ponds (acres)	0	0	0
Lakes (acres)	0	0	0
Total	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 23 Summary of I-69 Northern Long-Eared Bat Maternity Remaining SAA Impacts

METRIC	Remaining SAA			
I-69 Section	**Section 4**	**Section 5**	**Section 6**	**Entire RSAA**
Forest Cover[1]				
Forest Cover Direct Impacts (acres)	0	56	219	275
Forest Cover Indirect Impacts (acres)	26	60	34	123
Forest Cover Cumulative Impacts (acres)	170	1,140	1,216	2,568
Forest Cover Total Impacts (acres)	196	1,256	1,469	2,966
NWI Wetlands[2]				
Forested (acres)	0	<1	2	2
Scrub/Shrub (acres)	0	<1	<1	<1
Emergent (acres)	0	<1	1	2
Ponds (acres)	0	<1	38	38
Lakes (acres)	0	0	0	0
Total	0	<1	3	4

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

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Hibernacula Foraging Area and WAA Analysis

This chapter includes the following topics:

Introduction

Fifty-five of 60 northern long-eared bat hibernacula foraging areas were identified within five miles of the proposed I-69 corridor. These hibernacula foraging areas were analyzed for both direct impacts, as well as indirect impacts associated with the project and cumulative impacts from other sources. The analysis conducted for the 55 hibernacula is similar to how the 38 maternity colony foraging areas were analyzed. However, each hibernacula foraging area is a circle with a five-mile radius centered on the cave entrance. Cumulatively, these 55 hibernacula foraging area circles comprise the WAA. The five-mile radius distance was chosen because it is recommended by USFWS in their “Northern Long-Eared Bat Interim Conference and Planning Guidance” dated January 6, 2014.

Portions of five counties make up the WAA. They are Monroe County making up approximately 43% of the WAA; Greene County making up about 36%; Lawrence County making up approximately 13%; Martin County making up about 4%; and Owen County making up about 4%. The majority of the hibernacula foraging area centroids are in Monroe County at 37; Greene County has 11; Lawrence County has 7; and Owen and Martin counties have none (Figure 5).

Hibernacula Foraging Area Analysis

For the purposes of this document, the hibernacula foraging area analysis has been separated into three sections: direct impacts (Table 24), indirect and cumulative impacts (Table 25), and total impacts (Table 26). These impacts are summarized in the main text of this document and are shown in greater detail for each hibernaculum in Appendix F – WAA and Hibernacula Foraging Area.

Direct Impacts

The direct impact analysis focuses on how the direct transformation of land from its current state to an Interstate and its associated interchanges, frontage roads, access roads, grade separations, and other road improvements impact the foraging area for the hibernacula. Each hibernacula foraging area is approximately 50,265 acres (79 square miles) in size. Hibernacula foraging areas overlap each other and collectively form the WAA. Impacts for each hibernaculum foraging area cannot be added together to determine a total. Collectively, the total WAA area is 333,185 acres or approximately 521 square miles and also includes a small area at the south end of the hibernacula circles that includes TAZs taken into consideration for the indirect and cumulative analysis. The analysis on the hibernacula foraging areas was conducted in the same manner as the maternity colony evaluation. The Direct Impacts discussion for the maternity colony foraging areas contains additional information on how the analysis was performed.

The results of the hibernacula foraging area direct impact analysis are summarized in Table 24 Results are divided into three categories: (1) **No Build**, which represents the current conditions within the hibernacula foraging area; (2) **Build**, which represents conditions after the construction of I-69; and (3) the **Loss**, which represents the impacts resulting from I-69 construction (i.e., the difference between the No Build and Build conditions). Results are reported for each individual hibernacula and for the entire WAA.

<u>Foraging Area Forest Cover</u>

Refer to the Foraging Area Forest Cover discussion for the maternity colony foraging areas for an explanation on how this analysis was performed.

Total forest cover within each hibernaculum foraging area for the No Build scenario ranged from 22,585 acres (45% of the total area) in to 40,660 acres (81% of the total area) in **Forest core area** for the entire hibernaculum foraging area ranged from 6,607 acres (29% of all trees) in to 24,835 acres (61% of all trees) for The hibernacula foraging area showed the least amount of forest cover and least amount of forest core area, and hibernacula foraging area showed the greatest forest cover and forest core area.

Direct forest cover impacts within the cave foraging area circles resulting from any remaining Interstate construction (Sections 5 and 6) ranged from 0 or less than 1 acre for 46 of 55 hibernacula foraging areas to 17 acres and 38 acres for respectively. The remaining 7 caves had 2-3 acres of impact. Forest cover impacts were 1% or less of the forest cover within the hibernacula foraging areas. Forest core impacts ranged from 0 or <1 acre for 53 of the 55 hibernacula to 3 acres and 4 acres for the foraging area and the foraging area respectively. Impacts to forest cover and core forest were very small because construction in Section 5 is primarily along existing SR 37. The remaining impacts are to the forest edge.

<u>National Wetland Inventory (NWI) Wetlands</u>

Refer to the National Wetland Inventory (NWI) Wetland discussion for the maternity colony foraging areas for an explanation on how this analysis was performed.

Table 24 shows the total NWI wetlands present in the WAA and each hibernaculum foraging area for the No Build and Build conditions, as well as estimated NWI wetland impacts. The total wetlands present within each hibernaculum foraging area prior to construction of Sections 5 and 6 ranged from 55 acres for to 712 acres for The majority of the wetlands present were forested. Direct wetland impacts ranged from 0 acres or less than 1 acre for 53 of the 55 hibernaculum foraging areas to 1 acre and 4 acres for and respectively.

Indirect and Cumulative Impacts

In addition to direct impacts, indirect and cumulative impacts were calculated for each hibernacula foraging area. Refer to the Indirect and Cumulative Impacts discussion for the maternity colonies for an explanation on how the analysis was performed.

In the Tier 1 FEIS Cumulative Impacts Chapter 5.26, it was found in Indiana that forest loss since 1800 began to change in 1950 and possibly reached a plateau by the 1990s. Over the past 50 years, forests have been increasing in Indiana. Changing land management practices are contributing to this trend of increased forestation as some cropland and pasture are allowed to revert to forest and existing narrow wooded strips are allowed to expand. The increase in forests due to these changing practices have been greater than the losses from the conversion of forests to agriculture, urban/suburban expansion, and other uses in the past 50 years. This does not necessarily mean that forests are increasing in all areas of the state, rather that when viewed as a whole, they tend to be rising. Forest land in Indiana has increased from 4.1 million acres in 1950 to 4.9 million acres in 2013 (Gormanson, 2014).

Appendix G of the Tier 1 FEIS shows that in Greene and Monroe counties, which constitute the majority of the WAA, forests have increased or remained relatively constant from 1950 to 1998 according the USDA Forest Service. Additional data for 2009-2013 from the Forest Service (Table 10) show that forest acreage for Greene County has decreased from 2004 to 2013, while forest acreage in Monroe County has increased during that time. Forest acreages in Greene County were estimated at 101,000 acres in 1950 and 110,388 acres in 2013. Forest acreages in Monroe County were estimated at 132,000 acres in 1950 and 149,731 acres in 2013.

It is important to note that in the indirect and cumulative analysis completed for this project, impacts to forests were determined by applying the percentage of expected development to the forest available in each TAZ. In practice, development is more likely to occur in agricultural areas, which are easier to develop. Also, much of the forest is located in floodplain and wetland areas, or areas of more severe terrain that are more costly to develop. It is also possible that induced growth in households and employment predicted by the REMI model could occur in areas already developed, such as existing housing additions or commercial and industrial parks. The analysis also does not factor in any reforestation (i.e., increase to the forest cover base) resulting from the I-69 mitigation. Nor does it account for reforestation anticipated in the region based on historic trends. Forest impacts as part of this analysis should be viewed as a "worst-case" scenario for the northern long-eared bat, which only presents potential gross losses without estimating gains in forest due to the factors cited here.

Table 25 summarizes the indirect, cumulative, and total indirect and cumulative impacts for the 55 hibernacula foraging areas analyzed. Indirect impacts are those that are predicted to occur as a result of the I-69 project. **Total indirect development** (including both forest and agricultural land) for the entire WAA was estimated at 184 acres or <1%. Total indirect development ranged from 0 acres for the foraging area to 75 acres for the foraging area. All estimated indirect development is between 0 and <1% within each of the hibernacula foraging areas.

Forest cover impacts resulting from indirect development for the entire WAA were estimated at 99 acres or <1% of the total forest cover available in the area. Forest cover impacts ranged from 0 acres for to 46 acres for . All forest cover impacts resulting from indirect impacts were 0 or <1% of the total forest cover available to the individual foraging areas. Approximately 85 acres of agricultural land is estimated to be indirectly impacted by the I-69 project in the WAA. Indirect agricultural land impacts ranged from 0 acres for to 41 acres for

Cumulative impacts are those that are believed to occur regardless of the I-69 project. For all hibernacula foraging areas, estimated cumulative impacts were larger than indirect impacts. **Total cumulative development** (including both forest and agricultural land) for the entire WAA was estimated at 4,289 acres or 1% of the entire area. Total cumulative development ranged from 65 acres for the foraging area to 2,363 acres and 2,442 acres for the foraging area and the foraging area respectively. The estimated cumulative development for each hibernacula foraging area ranged from <1% of the total hibernacula foraging area to 5% for and

Forest cover impacts resulting from cumulative development for the entire WAA were estimated at 2,693 acres or 1% of the total forest cover available in the area. Forest cover impacts ranged from 26 acres for to 1,566 acres and 1,581 acres for the foraging area and the foraging area respectively. All forest cover impacts resulting from cumulative impacts ranged from <1% to 7% of the total forest cover available to the individual foraging areas. Approximately 1,596 acres of agricultural land is estimated to be impacted by cumulative development in the WAA, primarily in the vicinity of Bloomington. Cumulative agricultural land impacts ranged from 39 acres for the to 797 acres and 861 acres for and

Total indirect and cumulative impacts (not including direct impacts) for the entire WAA are estimated at 4,473 acres, or 1% of the total area. Total indirect and cumulative impacts corresponded closely with cumulative impacts since cumulative impacts made up the majority of the total. Total indirect and cumulative impacts ranged from 84 acres for hibernacula foraging area to 2,409 acres and 2,517 acres for and respectively. All total indirect and cumulative impacts ranged from less than 1% of the total foraging area available to 5% for and .

Total indirect and cumulative forest cover impacts in the entire WAA were estimated at 2,792 acres or 1% of the total forest cover available in the area. Total indirect and cumulative forest cover impacts ranged from 34 acres for to 1,596 acres and 1,627 acres for and respectively. All total indirect and cumulative forest cover impacts ranged from <1% to 7% of the total forest cover available to the individual hibernacula foraging areas. A total of 1,681 acres of agricultural land is estimated to be impacted in the WAA. Total indirect and cumulative agricultural land impacts ranged from 50 acres for the to 813 acres and 890 acres for and respectively.

Total Impacts (Including Direct, Indirect and Cumulative)

Table 26 summarizes the total forest cover impacts (including direct, indirect and cumulative) and NWI wetland impacts for each hibernaculum foraging area.

Total forest cover impacts, including direct, indirect, and cumulative, for the entire WAA were 2,830 acres. Total forest cover impacts for each hibernaculum foraging area ranged from 34 acres for to 1,634 acres and 1,644 acres for and respectively. The majority of the total impacts for all foraging areas are indirect and cumulative development. Direct impacts made up a relatively small percentage of the total forest cover impacts for the hibernacula foraging areas. Direct forest impacts for the and foraging areas, within which clearing in Section 5 has not been completed, will include 38 acres and 17 acres respectively of forest cover loss.

Total NWI wetland impacts ranged from zero acres or <1 acre for 53 of the 55 hibernacula foraging areas. and had 1 acre and 4 acres of total NWI wetland impacts respectively.

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	36345	32830	32596	28285	32655
Total Forest Cover (% of landscape)	72%	65%	65%	56%	65%
Forest Core Area (acres)[2]	18,848	15,411	15,116	11,854	15,140
Forest Core Area (% of total forest)	52%	47%	46%	42%	46%
# of Forest Core Areas	342	675	696	465	622
Forest Edge Area (acres)[3]	17,497	17,420	17,480	16,431	17,515
Forest Edge Area (% of total forest)	48%	53%	54%	58%	54%
Build					
Total Forest Cover (acres)[1]	36,345	32,830	32,595	28,283	32,655
Total Forest Cover (% of landscape)	72%	65%	65%	56%	65%
Forest Core Area (acres)[2]	18,848	15,411	15,116	11,854	15,140
Forest Core Area (% of total forest)	52%	47%	46%	42%	46%
# of Forest Core Areas	342	675	696	465	622
Forest Edge Area (acres)[3]	17,497	17,419	17,480	16,429	17,515
Forest Edge Area (% of total forest)	48%	53%	54%	58%	54%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	<1	<1	2	<1
Total Forest Cover (% of landscape)	0%	<-1%	<-1%	<-1%	<-1%
Forest Core Area (acres)[2]	0	<1	<1	<1	<1
Forest Core Area (% change)	0%	<1%	<1%	<1%	<1%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	<1	<1	2	<1
Forest Edge Area (% change)	0%	<-1%	<-1%	<-1%	<-1%
Forest Floodplain					
No Build					
Total (acres)	1172	1421	1350	1403	1450
Build					
Total (acres)	1172	1421	1350	1403	1450
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	122	105	119	78	82
Forested (PFO (acres)[4]	116	82	96	48	59
Scrub/Shrub (PSS) (acres)	0	7	7	7	7
Emergent (PEM) (acres)	6	16	16	23	16
Ponds (PAB, PUB, PUS) (acres)	102	113	116	123	113
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	122	104	119	78	82
Forested (PFO (acres)[4]	116	81	96	48	59
Scrub/Shrub (PSS) (acres)	0	7	7	7	7
Emergent (PEM) (acres)	6	16	15	23	16
Ponds (PAB, PUB, PUS) (acres)	102	113	116	123	113
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	0	<1	<1	<1	<1
Forested (PFO (acres)[4]	0	<1	<1	<1	<1
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	<1	<1	<1	<1
Ponds (PAB, PUB, PUS) (acres)	0	<1	<1	<1	<1
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	34472	26726	34753	29520	33306
Total Forest Cover (% of landscape)	69%	53%	69%	59%	66%
Forest Core Area (acres)[2]	17,274	8,020	17,554	13,320	16,064
Forest Core Area (% of total forest)	50%	30%	51%	45%	48%
# of Forest Core Areas	225	491	251	335	539
Forest Edge Area (acres)[3]	17,198	18,706	17,199	16,200	17,242
Forest Edge Area (% of total forest)	50%	70%	49%	55%	52%
Build					
Total Forest Cover (acres)[1]	34,472	26,726	34,753	29,518	33,306
Total Forest Cover (% of landscape)	69%	53%	69%	59%	66%
Forest Core Area (acres)[2]	17,274	8,020	17,554	13,320	16,064
Forest Core Area (% of total forest)	50%	30%	51%	45%	48%
# of Forest Core Areas	225	491	251	335	539
Forest Edge Area (acres)[3]	17,198	18,706	17,199	16,198	17,242
Forest Edge Area (% of total forest)	50%	70%	49%	55%	52%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	2	<1
Total Forest Cover (% of landscape)	0%	0%	0%	<-1%	<-1%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	<1%	<1%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	2	<1
Forest Edge Area (% change)	0%	0%	0%	<-1%	<-1%
Forest Floodplain					
No Build					
Total (acres)	1609	1151	1564	1978	1547
Build					
Total (acres)	1609	1151	1564	1978	1547
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	712	432	691	61	84
Forested (PFO (acres)[4]	666	407	645	37	61
Scrub/Shrub (PSS) (acres)	8	5	8	7	7
Emergent (PEM) (acres)	38	20	38	17	15
Ponds (PAB, PUB, PUS) (acres)	166	124	166	132	104
Lakes (L)	0	1187	0	0	0
Build					
Total (acres)	712	432	691	61	83
Forested (PFO (acres)[4]	666	407	645	37	61
Scrub/Shrub (PSS) (acres)	8	5	8	7	7
Emergent (PEM) (acres)	38	20	38	17	15
Ponds (PAB, PUB, PUS) (acres)	166	124	166	132	104
Lakes (L)	0	1187	0	0	0
Loss (Impacts)					
Total (acres)	0	0	0	0	<1
Forested (PFO (acres)[4]	0	0	0	0	<1
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	<1
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	<1
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 5**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	32568	28246	27900	36617	32319
Total Forest Cover (% of landscape)	65%	56%	56%	73%	64%
Forest Core Area (acres)[2]	12,261	11,726	11,351	19,058	12,014
Forest Core Area (% of total forest)	38%	42%	41%	52%	37%
# of Forest Core Areas	814	504	255	402	783
Forest Edge Area (acres)[3]	20,306	16,520	16,548	17,559	20,305
Forest Edge Area (% of total forest)	62%	58%	59%	48%	63%
Build					
Total Forest Cover (acres)[1]	32,568	28,244	27,900	36,617	32,319
Total Forest Cover (% of landscape)	65%	56%	56%	73%	64%
Forest Core Area (acres)[2]	12,261	11,726	11,351	19,058	12,014
Forest Core Area (% of total forest)	38%	42%	41%	52%	37%
# of Forest Core Areas	814	504	255	402	783
Forest Edge Area (acres)[3]	20,306	16,518	16,548	17,559	20,305
Forest Edge Area (% of total forest)	62%	58%	59%	48%	63%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	2	0	0	0
Total Forest Cover (% of landscape)	0%	<-1%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	<1%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	2	0	0	0
Forest Edge Area (% change)	0%	<-1%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	855	1434	1779	1193	859
Build					
Total (acres)	855	1434	1779	1193	859
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 5**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	285	105	113	555	285
Forested (PFO (acres)[4]	270	72	91	512	268
Scrub/Shrub (PSS) (acres)	9	7	7	8	9
Emergent (PEM) (acres)	7	25	14	34	8
Ponds (PAB, PUB, PUS) (acres)	110	124	144	136	112
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	285	104	113	555	285
Forested (PFO (acres)[4]	270	72	91	512	268
Scrub/Shrub (PSS) (acres)	9	7	7	8	9
Emergent (PEM) (acres)	7	25	14	34	8
Ponds (PAB, PUB, PUS) (acres)	110	124	144	136	112
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	0	<1	0	0	0
Forested (PFO (acres)[4]	0	<1	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	<1	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	<1	0	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 5**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	29873	31737	31489	31948	38665
Total Forest Cover (% of landscape)	59%	63%	63%	64%	77%
Forest Core Area (acres)[2]	11,144	14,738	11,069	13,382	21,674
Forest Core Area (% of total forest)	37%	46%	35%	42%	56%
# of Forest Core Areas	679	512	757	779	372
Forest Edge Area (acres)[3]	18,729	16,999	20,420	18,566	16,991
Forest Edge Area (% of total forest)	63%	54%	65%	58%	44%
Build					
Total Forest Cover (acres)[1]	29,873	31,736	31,489	31,947	38,665
Total Forest Cover (% of landscape)	59%	63%	63%	64%	77%
Forest Core Area (acres)[2]	11,144	14,738	11,069	13,382	21,674
Forest Core Area (% of total forest)	37%	46%	35%	42%	56%
# of Forest Core Areas	679	512	757	779	372
Forest Edge Area (acres)[3]	18,729	16,998	20,420	18,566	16,991
Forest Edge Area (% of total forest)	63%	54%	65%	58%	44%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	<1	0	<1	0
Total Forest Cover (% of landscape)	0%	<-1%	0%	<-1%	0%
Forest Core Area (acres)[2]	0	0	0	<1	0
Forest Core Area (% change)	0%	<1%	0%	<1%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	<1	0	<1	0
Forest Edge Area (% change)	0%	<-1%	0%	<-1%	0%
Forest Floodplain					
No Build					
Total (acres)	1116	1543	876	1213	1138
Build					
Total (acres)	1116	1543	876	1213	1138
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 5**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	254	64	279	237	299
Forested (PFO (acres)[4]	224	39	268	214	276
Scrub/Shrub (PSS) (acres)	12	7	4	7	7
Emergent (PEM) (acres)	18	18	7	16	15
Ponds (PAB, PUB, PUS) (acres)	136	121	110	121	114
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	254	64	279	237	299
Forested (PFO (acres)[4]	224	38	268	214	276
Scrub/Shrub (PSS) (acres)	12	7	4	7	7
Emergent (PEM) (acres)	18	18	7	16	15
Ponds (PAB, PUB, PUS) (acres)	136	121	110	121	114
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	<1	<1	0	<1	0
Forested (PFO (acres)[4]	<1	<1	0	<1	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	<1	0	0	0
Ponds (PAB, PUB, PUS) (acres)	<1	<1	0	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 5**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	25604	27525	27054	29669	29441
Total Forest Cover (% of landscape)	51%	55%	54%	59%	59%
Forest Core Area (acres)[2]	9,138	10,014	9,746	10,597	10,389
Forest Core Area (% of total forest)	36%	36%	36%	36%	35%
# of Forest Core Areas	429	544	505	417	607
Forest Edge Area (acres)[3]	16,466	17,511	17,307	19,071	19,052
Forest Edge Area (% of total forest)	64%	64%	64%	64%	65%
Build					
Total Forest Cover (acres)[1]	25,602	27,525	27,053	29,669	29,441
Total Forest Cover (% of landscape)	51%	55%	54%	59%	59%
Forest Core Area (acres)[2]	9,138	10,014	9,746	10,597	10,389
Forest Core Area (% of total forest)	36%	36%	36%	36%	35%
# of Forest Core Areas	429	544	505	417	607
Forest Edge Area (acres)[3]	16,464	17,511	17,307	19,071	19,052
Forest Edge Area (% of total forest)	64%	64%	64%	64%	65%
Loss (Impacts)					
Total Forest Cover (acres)[1]	2	<1	<1	0	0
Total Forest Cover (% of landscape)	<-1%	<-1%	<-1%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	<1%	<1%	<1%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	2	<1	<1	0	0
Forest Edge Area (% change)	<-1%	<-1%	<-1%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	1102	1164	1154	991	905
Build					
Total (acres)	1102	1164	1154	991	905
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 5**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	189	207	205	124	240
Forested (PFO (acres)[4]	156	174	172	94	215
Scrub/Shrub (PSS) (acres)	9	9	9	0	4
Emergent (PEM) (acres)	24	24	24	30	20
Ponds (PAB, PUB, PUS) (acres)	147	156	155	111	112
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	189	206	205	124	240
Forested (PFO (acres)[4]	156	173	172	94	215
Scrub/Shrub (PSS) (acres)	9	9	9	0	4
Emergent (PEM) (acres)	24	24	24	30	20
Ponds (PAB, PUB, PUS) (acres)	147	156	155	111	112
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	<1	<1	<1	0	0
Forested (PFO (acres)[4]	<1	<1	<1	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	<1	<1	0	0
Ponds (PAB, PUB, PUS) (acres)	<1	<1	<1	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	24381	22585	23799	28204	28900
Total Forest Cover (% of landscape)	49%	45%	47%	56%	57%
Forest Core Area (acres)[2]	7,972	6,607	8,383	8,691	10,969
Forest Core Area (% of total forest)	33%	29%	35%	31%	38%
# of Forest Core Areas	144	358	262	571	610
Forest Edge Area (acres)[3]	16,410	15,978	15,416	19,513	17,931
Forest Edge Area (% of total forest)	67%	71%	65%	69%	62%
Build					
Total Forest Cover (acres)[1]	24,343	22,582	23,782	28,204	28,899
Total Forest Cover (% of landscape)	48%	45%	47%	56%	57%
Forest Core Area (acres)[2]	7,968	6,607	8,380	8,691	10,969
Forest Core Area (% of total forest)	33%	29%	35%	31%	38%
# of Forest Core Areas	144	358	262	571	610
Forest Edge Area (acres)[3]	16,375	15,975	15,402	19,513	17,930
Forest Edge Area (% of total forest)	67%	71%	65%	69%	62%
Loss (Impacts)					
Total Forest Cover (acres)[1]	38	3	17	0	<1
Total Forest Cover (% of landscape)	<-1%	<-1%	<-1%	0%	<-1%
Forest Core Area (acres)[2]	4	0	3	0	0
Forest Core Area (% change)	<1%	<1%	<1%	0%	<1%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	35	3	14	0	<1
Forest Edge Area (% change)	<-1%	<-1%	<-1%	0%	<-1%
Forest Floodplain					
No Build					
Total (acres)	1645	891	1629	920	1181
Build					
Total (acres)	1640	891	1625	920	1181
Loss (Impacts)					
Total (acres)	5	0	4	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	433	172	88	295	219
Forested (PFO (acres)[4]	362	143	53	273	186
Scrub/Shrub (PSS) (acres)	53	9	15	4	9
Emergent (PEM) (acres)	18	20	20	18	23
Ponds (PAB, PUB, PUS) (acres)	169	140	142	120	154
Lakes (L)	110	0	87	500	0
Build					
Total (acres)	430	172	87	295	218
Forested (PFO (acres)[4]	360	143	52	273	186
Scrub/Shrub (PSS) (acres)	53	9	15	4	9
Emergent (PEM) (acres)	16	20	20	18	23
Ponds (PAB, PUB, PUS) (acres)	169	140	142	120	154
Lakes (L)	110	0	87	500	0
Loss (Impacts)					
Total (acres)	4	<1	1	0	<1
Forested (PFO (acres)[4]	1	<1	<1	0	<1
Scrub/Shrub (PSS) (acres)	<1	0	0	0	0
Emergent (PEM) (acres)	2	<1	<1	0	<1
Ponds (PAB, PUB, PUS) (acres)	<1	<1	<1	0	<1
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	40660	37700	36777	30868	33258
Total Forest Cover (% of landscape)	81%	75%	73%	61%	66%
Forest Core Area (acres)[2]	24,835	21,127	18,934	11,599	13,413
Forest Core Area (% of total forest)	61%	56%	51%	38%	40%
# of Forest Core Areas	290	286	592	560	842
Forest Edge Area (acres)[3]	15,824	16,573	17,843	19,269	19,845
Forest Edge Area (% of total forest)	39%	44%	49%	62%	60%
Build					
Total Forest Cover (acres)[1]	40,660	37,700	36,777	30,868	33,258
Total Forest Cover (% of landscape)	81%	75%	73%	61%	66%
Forest Core Area (acres)[2]	24,835	21,127	18,934	11,599	13,413
Forest Core Area (% of total forest)	61%	56%	51%	38%	40%
# of Forest Core Areas	290	286	592	560	842
Forest Edge Area (acres)[3]	15,824	16,573	17,843	19,269	19,845
Forest Edge Area (% of total forest)	39%	44%	49%	62%	60%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	0	0	0
Total Forest Cover (% of landscape)	0%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	0%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	0	0	0
Forest Edge Area (% change)	0%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	1204	951	1229	935	846
Build					
Total (acres)	1204	951	1229	935	846
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	262	425	461	114	262
Forested (PFO (acres)[4]	244	395	446	93	252
Scrub/Shrub (PSS) (acres)	6	9	8	<1	4
Emergent (PEM) (acres)	12	22	7	21	5
Ponds (PAB, PUB, PUS) (acres)	98	126	127	113	104
Lakes (L)	88	40	0	0	0
Build					
Total (acres)	262	425	461	114	262
Forested (PFO (acres)[4]	244	395	446	93	252
Scrub/Shrub (PSS) (acres)	6	9	8	<1	4
Emergent (PEM) (acres)	12	22	7	21	5
Ponds (PAB, PUB, PUS) (acres)	98	126	127	113	104
Lakes (L)	88	40	0	0	0
Loss (Impacts)					
Total (acres)	0	0	0	0	0
Forested (PFO (acres)[4]	0	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	0	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	Section 4	Section 4	Section 4	Section 5	Section 4
Landscape Area (acres)	50,265	50,265	50,265	50,265	50,265
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	33316	35352	29774	29441	36577
Total Forest Cover (% of landscape)	66%	70%	59%	59%	73%
Forest Core Area (acres)[2]	15,804	16,050	10,755	13,263	18,267
Forest Core Area (% of total forest)	47%	45%	36%	45%	50%
# of Forest Core Areas	653	887	421	299	354
Forest Edge Area (acres)[3]	17,512	19,302	19,019	16,178	18,310
Forest Edge Area (% of total forest)	53%	55%	64%	55%	50%
Build					
Total Forest Cover (acres)[1]	33,316	35,352	29,774	29,441	36,577
Total Forest Cover (% of landscape)	66%	70%	59%	59%	73%
Forest Core Area (acres)[2]	15,804	16,050	10,755	13,263	18,267
Forest Core Area (% of total forest)	47%	45%	36%	45%	50%
# of Forest Core Areas	653	887	421	299	354
Forest Edge Area (acres)[3]	17,512	19,302	19,019	16,178	18,310
Forest Edge Area (% of total forest)	53%	55%	64%	55%	50%
Loss (Impacts)					
Total Forest Cover (acres)[1]	<1	0	0	0	0
Total Forest Cover (% of landscape)	<-1%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	<1%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	<1	0	0	0	0
Forest Edge Area (% change)	<-1%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	1492	917	996	1990	1171
Build					
Total (acres)	1492	917	996	1990	1171
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	101	177	124	79	340
Forested (PFO (acres)[4]	79	170	95	55	305
Scrub/Shrub (PSS) (acres)	7	<1	0	7	19
Emergent (PEM) (acres)	15	7	29	16	17
Ponds (PAB, PUB, PUS) (acres)	107	121	110	144	186
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	101	177	124	79	340
Forested (PFO (acres)[4]	78	170	95	55	305
Scrub/Shrub (PSS) (acres)	7	<1	0	7	19
Emergent (PEM) (acres)	15	7	29	16	17
Ponds (PAB, PUB, PUS) (acres)	107	121	110	144	186
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	<1	0	0	0	0
Forested (PFO (acres)[4]	<1	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	<1	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	29809	30635	36586	37876	35355
Total Forest Cover (% of landscape)	59%	61%	73%	75%	70%
Forest Core Area (acres)[2]	11,280	10,354	19,710	19,772	15,536
Forest Core Area (% of total forest)	38%	34%	54%	52%	44%
# of Forest Core Areas	681	710	286	503	738
Forest Edge Area (acres)[3]	18,529	20,282	16,876	18,104	19,818
Forest Edge Area (% of total forest)	62%	66%	46%	48%	56%
Build					
Total Forest Cover (acres)[1]	29,809	30,635	36,586	37,876	35,355
Total Forest Cover (% of landscape)	59%	61%	73%	75%	70%
Forest Core Area (acres)[2]	11,280	10,354	19,710	19,772	15,536
Forest Core Area (% of total forest)	38%	34%	54%	52%	44%
# of Forest Core Areas	681	710	286	503	738
Forest Edge Area (acres)[3]	18,529	20,282	16,876	18,104	19,818
Forest Edge Area (% of total forest)	62%	66%	46%	48%	56%
Loss (Impacts)					
Total Forest Cover (acres)[1]	<1	0	0	0	0
Total Forest Cover (% of landscape)	<-1%	0%	0%	0%	0%
Forest Core Area (acres)[2]	0	0	0	0	0
Forest Core Area (% change)	<1%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	<1	0	0	0	0
Forest Edge Area (% change)	<-1%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	1155	889	930	1070	887
Build					
Total (acres)	1155	889	930	1070	887
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	254	290	435	237	182
Forested (PFO (acres)[4]	224	277	406	224	177
Scrub/Shrub (PSS) (acres)	11	4	7	6	<1
Emergent (PEM) (acres)	19	9	22	7	4
Ponds (PAB, PUB, PUS) (acres)	132	116	130	124	98
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	254	290	435	237	182
Forested (PFO (acres)[4]	224	277	406	224	177
Scrub/Shrub (PSS) (acres)	11	4	7	6	<1
Emergent (PEM) (acres)	19	9	22	7	4
Ponds (PAB, PUB, PUS) (acres)	132	116	130	124	98
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	<1	0	0	0	0
Forested (PFO (acres)[4]	<1	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	<1	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 5**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	23652	35493	34324	31232	32301
Total Forest Cover (% of landscape)	47%	71%	68%	62%	64%
Forest Core Area (acres)[2]	7,917	17,508	14,670	12,486	13,742
Forest Core Area (% of total forest)	33%	49%	43%	40%	43%
# of Forest Core Areas	365	707	845	346	435
Forest Edge Area (acres)[3]	15,736	17,985	19,655	18,747	18,559
Forest Edge Area (% of total forest)	67%	51%	57%	60%	57%
Build					
Total Forest Cover (acres)[1]	23,650	35,493	34,324	31,232	32,301
Total Forest Cover (% of landscape)	47%	71%	68%	62%	64%
Forest Core Area (acres)[2]	7,917	17,508	14,670	12,486	13,742
Forest Core Area (% of total forest)	33%	49%	43%	40%	43%
# of Forest Core Areas	365	707	845	346	435
Forest Edge Area (acres)[3]	15,733	17,985	19,655	18,747	18,559
Forest Edge Area (% of total forest)	67%	51%	57%	60%	57%
Loss (Impacts)					
Total Forest Cover (acres)[1]	3	0	0	0	0
Total Forest Cover (% of landscape)	<-1%	0%	0%	0%	0%
Forest Core Area (acres)[2]	<1	0	0	0	0
Forest Core Area (% change)	<1%	0%	0%	0%	0%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	3	0	0	0	0
Forest Edge Area (% change)	<-1%	0%	0%	0%	0%
Forest Floodplain					
No Build					
Total (acres)	1091	1464	982	1116	1089
Build					
Total (acres)	1091	1464	982	1116	1089
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 5**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	157	147	285	101	128
Forested (PFO (acres)[4]	128	127	268	74	102
Scrub/Shrub (PSS) (acres)	9	5	7	0	0
Emergent (PEM) (acres)	20	14	10	27	26
Ponds (PAB, PUB, PUS) (acres)	140	109	112	116	115
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	156	147	285	101	128
Forested (PFO (acres)[4]	128	127	268	74	102
Scrub/Shrub (PSS) (acres)	9	5	7	0	0
Emergent (PEM) (acres)	20	14	10	27	26
Ponds (PAB, PUB, PUS) (acres)	140	109	112	116	115
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	<1	0	0	0	0
Forested (PFO (acres)[4]	<1	0	0	0	0
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	<1	0	0	0	0
Ponds (PAB, PUB, PUS) (acres)	<1	0	0	0	0
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Hibernacula Foraging Area Forest Cover					
No Build					
Total Forest Cover (acres)[1]	29467	29431	29173	34509	33315
Total Forest Cover (% of landscape)	59%	59%	58%	69%	66%
Forest Core Area (acres)[2]	10,397	10,366	12,614	14,987	15,857
Forest Core Area (% of total forest)	35%	35%	43%	43%	48%
# of Forest Core Areas	359	368	381	878	624
Forest Edge Area (acres)[3]	19,070	19,065	16,559	19,522	17,458
Forest Edge Area (% of total forest)	65%	65%	57%	57%	52%
Build					
Total Forest Cover (acres)[1]	29,467	29,431	29,170	34,509	33,314
Total Forest Cover (% of landscape)	59%	59%	58%	69%	66%
Forest Core Area (acres)[2]	10,397	10,366	12,614	14,987	15,857
Forest Core Area (% of total forest)	35%	35%	43%	43%	48%
# of Forest Core Areas	359	368	381	878	624
Forest Edge Area (acres)[3]	19,070	19,065	16,556	19,522	17,457
Forest Edge Area (% of total forest)	65%	65%	57%	57%	52%
Loss (Impacts)					
Total Forest Cover (acres)[1]	0	0	3	0	<1
Total Forest Cover (% of landscape)	0%	0%	<-1%	0%	<-1%
Forest Core Area (acres)[2]	0	0	<1	0	0
Forest Core Area (% change)	0%	0%	<1%	0%	<1%
Change in # of Forest Core Areas	0	0	0	0	0
Forest Edge Area (acres)[3]	0	0	3	0	<1
Forest Edge Area (% change)	0%	0%	<-1%	0%	<-1%
Forest Floodplain					
No Build					
Total (acres)	1002	1001	1524	757	1517
Build					
Total (acres)	1002	1001	1524	757	1517
Loss (Impacts)					
Total (acres)	0	0	0	0	0

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area				
I-69 Section	**Section 4**	**Section 4**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Wetlands (NWI)					
No Build					
Total (acres)	132	130	55	208	97
Forested (PFO (acres)[4]	101	98	25	204	74
Scrub/Shrub (PSS) (acres)	0	0	7	<1	7
Emergent (PEM) (acres)	31	32	23	5	16
Ponds (PAB, PUB, PUS) (acres)	111	112	126	101	106
Lakes (L)	0	0	0	0	0
Build					
Total (acres)	132	130	55	208	97
Forested (PFO (acres)[4]	101	98	25	204	74
Scrub/Shrub (PSS) (acres)	0	0	7	<1	7
Emergent (PEM) (acres)	31	32	23	5	16
Ponds (PAB, PUB, PUS) (acres)	111	112	126	101	106
Lakes (L)	0	0	0	0	0
Loss (Impacts)					
Total (acres)	0	0	<1	0	<1
Forested (PFO (acres)[4]	0	0	<1	0	<1
Scrub/Shrub (PSS) (acres)	0	0	0	0	0
Emergent (PEM) (acres)	0	0	<1	0	<1
Ponds (PAB, PUB, PUS) (acres)	0	0	<1	0	<1
Lakes (L)	0	0	0	0	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor

[2] Forest Core Area was limited to a threshold of 1 acre minimum

[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area Expanded WAA
Landscape Area (acres)	**333,185**
Hibernacula Foraging Area Forest Cover	
No Build	
Total Forest Cover (acres)[1]	207543
Total Forest Cover (% of landscape)	62%
Forest Core Area (acres)[2]	91,145
Forest Core Area (% of total forest)	44%
# of Forest Core Areas	603
Forest Edge Area (acres)[3]	116,398
Forest Edge Area (% of total forest)	56%
Build	
Total Forest Cover (acres)[1]	207,505
Total Forest Cover (% of landscape)	62%
Forest Core Area (acres)[2]	91,142
Forest Core Area (% of total forest)	44%
# of Forest Core Areas	603
Forest Edge Area (acres)[3]	116,363
Forest Edge Area (% of total forest)	56%
Loss (Impacts)	
Total Forest Cover (acres)[1]	38
Total Forest Cover (% of landscape)	<-1%
Forest Core Area (acres)[2]	4
Forest Core Area (% change)	<1%
Change in # of Forest Core Areas	0
Forest Edge Area (acres)[3]	35
Forest Edge Area (% change)	<-1%
Forest Floodplain	
No Build	
Total (acres)	9023
Build	
Total (acres)	9018
Loss (Impacts)	
Total (acres)	5

Table 24 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Direct Impact Analysis

METRIC	Hibernacula Foraging Area Expanded WAA
Landscape Area (acres)	**333,185**
Wetlands (NWI)	
No Build	
Total (acres)	2174
Forested (PFO (acres)[4]	1952
Scrub/Shrub (PSS) (acres)	96
Emergent (PEM) (acres)	126
Ponds (PAB, PUB, PUS) (acres)	931
Lakes (L)	1407
Build	
Total (acres)	2170
Forested (PFO (acres)[4]	1951
Scrub/Shrub (PSS) (acres)	96
Emergent (PEM) (acres)	123
Ponds (PAB, PUB, PUS) (acres)	931
Lakes (L)	1407
Loss (Impacts)	
Total (acres)	4
Forested (PFO (acres)[4]	1
Scrub/Shrub (PSS) (acres)	<1
Emergent (PEM) (acres)	2
Ponds (PAB, PUB, PUS) (acres)	<1
Lakes (L)	0

[1] Forest Cover – defined as all forest area based on EEAC forest delineations within the I-69 Corridor and design right-of-way that extends beyond the Corridor
[2] Forest Core Area was limited to a threshold of 1 acre minimum
[3] Edge Area – defined as all forest cover not included in a core > 1acre

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**36,345**	**32,830**	**32,596**	**28,285**	**32,655**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	87	623	625	1307	674
Total Development (% of hibernacula area)	<1%	1%	1%	3%	1%
Forest Cover Impact (acres) [1]	35	392	392	830	422
Forest Cover Impact (% of total forest cover)	<1%	1%	1%	3%	1%
Agricultural Land Impact (acres)	52	232	233	477	252
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	69	588	583	1249	638
Total Development (% of hibernacula area)	<1%	1%	1%	2%	1%
Forest Cover Impact (acres) [1]	28	371	368	792	400
Forest Cover Impact (% of total forest cover)	<1%	1%	1%	3%	1%
Agricultural Land Impact (acres)	41	217	216	456	238
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	18	36	42	58	36
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	7	21	25	37	22
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	11	15	17	21	15

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**34,472**	**26,726**	**34,753**	**29,520**	**33,306**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	84	436	88	1374	584
Total Development (% of hibernacula area)	<1%	<1%	<1%	3%	1%
Forest Cover Impact (acres) [1]	34	271	35	888	384
Forest Cover Impact (% of total forest cover)	<1%	1%	<1%	3%	1%
Agricultural Land Impact (acres)	50	165	53	486	201
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	65	436	67	1361	577
Total Development (% of hibernacula area)	<1%	<1%	<1%	3%	1%
Forest Cover Impact (acres) [1]	26	271	27	879	381
Forest Cover Impact (% of total forest cover)	<1%	1%	<1%	3%	1%
Agricultural Land Impact (acres)	39	165	40	481	196
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	19	0	21	13	7
Total Development (% of hibernacula area)	<1%	0%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	8	0	8	9	2
Forest Cover Impact (% of total forest cover)	<1%	0%	<1%	<1%	<1%
Agricultural Land Impact (acres)	11	0	12	5	5

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
	DuBois				
I-69 Section	**Section 4**	**Section 5**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**32,568**	**28,246**	**27,900**	**36,617**	**32,319**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	287	1217	1513	186	301
Total Development (% of hibernacula area)	<1%	2%	3%	<1%	<1%
Forest Cover Impact (acres) [1]	169	764	972	74	180
Forest Cover Impact (% of total forest cover)	<1%	3%	3%	<1%	<1%
Agricultural Land Impact (acres)	118	453	542	112	122
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	266	1160	1495	130	282
Total Development (% of hibernacula area)	<1%	2%	3%	<1%	<1%
Forest Cover Impact (acres) [1]	160	727	960	52	172
Forest Cover Impact (% of total forest cover)	<1%	3%	3%	<1%	<1%
Agricultural Land Impact (acres)	106	432	535	78	110
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	20	57	19	56	19
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	8	36	12	22	8
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	12	20	7	34	12

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 5**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**29,873**	**31,737**	**31,489**	**31,948**	**38,665**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	754	919	251	547	123
Total Development (% of hibernacula area)	1%	2%	<1%	1%	<1%
Forest Cover Impact (acres) [1]	457	582	144	333	49
Forest Cover Impact (% of total forest cover)	2%	2%	<1%	1%	<1%
Agricultural Land Impact (acres)	297	337	107	214	74
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	691	891	231	483	85
Total Development (% of hibernacula area)	1%	2%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	418	563	136	296	34
Forest Cover Impact (% of total forest cover)	1%	2%	<1%	<1%	<1%
Agricultural Land Impact (acres)	273	328	95	188	51
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	63	28	20	64	38
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	39	19	8	38	15
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	24	9	12	26	23

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 5**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**25,604**	**27,525**	**27,054**	**29,669**	**29,441**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	1363	1187	1227	139	191
Total Development (% of hibernacula area)	3%	2%	2%	<1%	<1%
Forest Cover Impact (acres) [1]	880	753	783	62	100
Forest Cover Impact (% of total forest cover)	3%	3%	3%	<1%	<1%
Agricultural Land Impact (acres)	482	434	444	77	91
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	1308	1129	1170	129	177
Total Development (% of hibernacula area)	3%	2%	2%	<1%	<1%
Forest Cover Impact (acres) [1]	845	716	747	58	94
Forest Cover Impact (% of total forest cover)	3%	3%	3%	<1%	<1%
Agricultural Land Impact (acres)	463	413	423	71	83
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	55	58	57	10	14
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	35	37	36	4	6
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	19	21	21	6	9

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 5**	**Section 5**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**24,381**	**22,585**	**23,799**	**28,204**	**28,900**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	2409	1891	2517	399	960
Total Development (% of hibernacula area)	5%	4%	5%	<1%	2%
Forest Cover Impact (acres) [1]	1596	1291	1627	249	596
Forest Cover Impact (% of total forest cover)	7%	6%	7%	<1%	2%
Agricultural Land Impact (acres)	813	600	890	150	365
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	2363	1833	2442	398	900
Total Development (% of hibernacula area)	5%	4%	5%	<1%	2%
Forest Cover Impact (acres) [1]	1566	1253	1581	249	558
Forest Cover Impact (% of total forest cover)	6%	6%	7%	<1%	2%
Agricultural Land Impact (acres)	797	580	861	150	342
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	47	57	75	<1	61
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	30	37	46	<1	38
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	16	20	29	<1	23

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**40,660**	**37,700**	**36,777**	**30,868**	**33,258**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	98	102	224	165	228
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	39	41	91	75	116
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	59	61	133	90	112
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	67	72	156	140	191
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	27	29	64	66	101
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	40	43	92	75	90
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	31	30	68	25	37
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	12	12	27	10	15
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	18	18	41	15	22

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 5**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**33,316**	**35,352**	**29,774**	**29,441**	**36,577**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	562	269	138	1303	141
Total Development (% of hibernacula area)	1%	<1%	<1%	3%	<1%
Forest Cover Impact (acres) [1]	351	141	61	837	56
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	3%	<1%
Agricultural Land Impact (acres)	211	128	76	467	84
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	537	233	127	1291	104
Total Development (% of hibernacula area)	1%	<1%	<1%	3%	<1%
Forest Cover Impact (acres) [1]	336	126	57	828	42
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	3%	<1%
Agricultural Land Impact (acres)	200	107	70	462	63
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	25	36	11	13	36
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	15	14	4	8	15
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	10	22	7	5	22

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**29,809**	**30,635**	**36,586**	**37,876**	**35,355**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	782	246	107	161	212
Total Development (% of hibernacula area)	2%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	475	140	43	66	94
Forest Cover Impact (% of total forest cover)	2%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	307	105	64	95	118
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	720	227	77	114	162
Total Development (% of hibernacula area)	1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	437	133	31	47	74
Forest Cover Impact (% of total forest cover)	1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	283	94	46	67	88
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	63	19	30	48	51
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	39	7	12	19	20
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	24	11	18	29	30

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 5**	**Section 4**	**Section 4**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**23,650**	**35,493**	**34,324**	**31,232**	**32,301**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	1728	295	291	108	128
Total Development (% of hibernacula area)	3%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	1163	171	162	45	54
Forest Cover Impact (% of total forest cover)	5%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	564	123	128	63	74
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	1670	283	262	96	107
Total Development (% of hibernacula area)	3%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	1126	167	151	40	46
Forest Cover Impact (% of total forest cover)	5%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	544	117	111	56	61
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	58	12	29	12	21
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	38	5	12	5	8
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	20	7	17	7	12

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	Hibernacula Foraging Area Tree Cover				
I-69 Section	**Section 4**	**Section 4**	**Section 5**	**Section 4**	**Section 4**
Landscape Area (acres)	**50,265**	**50,265**	**50,265**	**50,265**	**50,265**
Total Forest Cover (acres)	**29,467**	**29,431**	**29,173**	**34,509**	**33,315**
INDIRECT & CUMULATIVE (2030 BUILD)					
Total Development (acres)	129	128	1535	232	578
Total Development (% of hibernacula area)	<1%	<1%	3%	<1%	1%
Forest Cover Impact (acres) [1]	57	56	994	113	363
Forest Cover Impact (% of total forest cover)	<1%	<1%	3%	<1%	1%
Agricultural Land Impact (acres)	72	71	541	119	215
CUMULATIVE[1] (2030 NO BUILD)					
Total Development (acres)	123	122	1482	188	554
Total Development (% of hibernacula area)	<1%	<1%	3%	<1%	1%
Forest Cover Impact (acres) [1]	54	54	959	95	349
Forest Cover Impact (% of total forest cover)	<1%	<1%	3%	<1%	1%
Agricultural Land Impact (acres)	69	68	523	92	206
INDIRECT (BUILD – NO BUILD)					
Total Development (acres)	6	5	53	45	24
Total Development (% of hibernacula area)	<1%	<1%	<1%	<1%	<1%
Forest Cover Impact (acres) [1]	2	2	35	18	14
Forest Cover Impact (% of total forest cover)	<1%	<1%	<1%	<1%	<1%
Agricultural Land Impact (acres)	3	3	19	27	10

[1] Determined based on a percentage of tree cover in the TAZ

Table 25 Summary of I-69 Northern Long-eared Bat Hibernacula Foraging Area Indirect and Cumulative Impact Analysis

METRIC	**Hibernacula Foraging Area Tree Cover**
I-69 Section	**Expanded WAA**
Landscape Area (acres)	**333,185**
Total Forest Cover (acres)	**207,505**
INDIRECT & CUMULATIVE (2030 BUILD)	
Total Development (acres)	4473
Total Development (% of hibernacula area)	1%
Forest Cover Impact (acres) [1]	2792
Forest Cover Impact (% of total forest cover)	1%
Agricultural Land Impact (acres)	1681
CUMULATIVE[1] (2030 NO BUILD)	
Total Development (acres)	4289
Total Development (% of hibernacula area)	1%
Forest Cover Impact (acres) [1]	2693
Forest Cover Impact (% of total forest cover)	1%
Agricultural Land Impact (acres)	1596
INDIRECT (BUILD – NO BUILD)	
Total Development (acres)	184
Total Development (% of hibernacula area)	<1%
Forest Cover Impact (acres) [1]	99
Forest Cover Impact (% of total forest cover)	<1%
Agricultural Land Impact (acres)	85

[1] Determined based on a percentage of tree cover in the TAZ

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	<1	<1	2	<1
Forest Cover Indirect Impacts (acres)	7	21	25	37	22
Forest Cover Cumulative Impacts (acres)	28	371	368	792	400
Forest Cover Total Impacts (acres)	35	392	393	831	422
NWI Wetlands[2]					
Forested (acres)	0	<1	<1	<1	<1
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	<1	<1	<1	<1
Ponds (acres)	0	<1	<1	<1	<1
Lakes (acres)	0	0	0	0	0
Total	0	<1	<1	<1	<1

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	2	<1
Forest Cover Indirect Impacts (acres)	8	0	8	9	2
Forest Cover Cumulative Impacts (acres)	26	271	27	879	381
Forest Cover Total Impacts (acres)	34	271	35	890	383
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	<1
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	<1
Ponds (acres)	0	0	0	0	<1
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	<1

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	2	0	0	0
Forest Cover Indirect Impacts (acres)	8	36	12	22	8
Forest Cover Cumulative Impacts (acres)	160	727	960	52	172
Forest Cover Total Impacts (acres)	168	765	972	74	180
NWI Wetlands[2]					
Forested (acres)	0	<1	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	<1	0	0	0
Ponds (acres)	0	<1	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	<1	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	<1	0	<1	0
Forest Cover Indirect Impacts (acres)	39	19	8	38	15
Forest Cover Cumulative Impacts (acres)	418	563	136	296	34
Forest Cover Total Impacts (acres)	457	582	144	334	49
NWI Wetlands[2]					
Forested (acres)	<1	<1	0	<1	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	<1	<1	0	0	0
Ponds (acres)	<1	<1	0	0	0
Lakes (acres)	0	0	0	0	0
Total	<1	<1	0	<1	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	2	<1	<1	0	0
Forest Cover Indirect Impacts (acres)	35	37	36	4	6
Forest Cover Cumulative Impacts (acres)	845	716	747	58	94
Forest Cover Total Impacts (acres)	882	753	783	62	100
NWI Wetlands[2]					
Forested (acres)	<1	<1	<1	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	<1	<1	<1	0	0
Ponds (acres)	<1	<1	<1	0	0
Lakes (acres)	0	0	0	0	0
Total	<1	<1	<1	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	38	3	17	0	<1
Forest Cover Indirect Impacts (acres)	30	37	46	<1	38
Forest Cover Cumulative Impacts (acres)	1,566	1,253	1,581	249	558
Forest Cover Total Impacts (acres)	1,634	1,293	1,644	249	596
NWI Wetlands[2]					
Forested (acres)	1	<1	<1	0	<1
Scrub/Shrub (acres)	<1	0	0	0	0
Emergent (acres)	2	<1	<1	0	<1
Ponds (acres)	<1	<1	<1	0	<1
Lakes (acres)	0	0	0	0	0
Total	4	<1	1	0	<1

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	0	0	0
Forest Cover Indirect Impacts (acres)	12	12	27	10	15
Forest Cover Cumulative Impacts (acres)	27	29	64	66	101
Forest Cover Total Impacts (acres)	39	41	91	76	116
NWI Wetlands[2]					
Forested (acres)	0	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	0	0	0
Ponds (acres)	0	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	0	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.

[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	<1	0	0	0	0
Forest Cover Indirect Impacts (acres)	15	14	4	8	15
Forest Cover Cumulative Impacts (acres)	336	126	57	828	42
Forest Cover Total Impacts (acres)	351	140	61	836	57
NWI Wetlands[2]					
Forested (acres)	<1	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	<1	0	0	0	0
Ponds (acres)	<1	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	<1	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.

[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	<1	0	0	0	0
Forest Cover Indirect Impacts (acres)	39	7	12	19	20
Forest Cover Cumulative Impacts (acres)	437	133	31	47	74
Forest Cover Total Impacts (acres)	476	140	43	66	94
NWI Wetlands[2]					
Forested (acres)	<1	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	<1	0	0	0	0
Ponds (acres)	<1	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	<1	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	3	0	0	0	0
Forest Cover Indirect Impacts (acres)	38	5	12	5	8
Forest Cover Cumulative Impacts (acres)	1,126	167	151	40	46
Forest Cover Total Impacts (acres)	1,167	172	163	45	54
NWI Wetlands[2]					
Forested (acres)	<1	0	0	0	0
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	<1	0	0	0	0
Ponds (acres)	<1	0	0	0	0
Lakes (acres)	0	0	0	0	0
Total	<1	0	0	0	0

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA				
Forest Cover[1]					
Forest Cover Direct Impacts (acres)	0	0	3	0	<1
Forest Cover Indirect Impacts (acres)	2	2	35	18	14
Forest Cover Cumulative Impacts (acres)	54	54	959	95	349
Forest Cover Total Impacts (acres)	56	56	997	113	363
NWI Wetlands[2]					
Forested (acres)	0	0	<1	0	<1
Scrub/Shrub (acres)	0	0	0	0	0
Emergent (acres)	0	0	<1	0	<1
Ponds (acres)	0	0	<1	0	<1
Lakes (acres)	0	0	0	0	0
Total	0	0	<1	0	<1

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Table 26 Summary of I-69 Northern Long-Eared Bat Hibernacula Foraging Impact Analysis

METRIC	HIBERNACULA FORAGING AREA
	Expanded WAA
Forest Cover[1]	
Forest Cover Direct Impacts (acres)	38
Forest Cover Indirect Impacts (acres)	99
Forest Cover Cumulative Impacts (acres)	2,693
Forest Cover Total Impacts (acres)	2,830
NWI Wetlands[2]	
Forested (acres)	1
Scrub/Shrub (acres)	<1
Emergent (acres)	2
Ponds (acres)	<1
Lakes (acres)	0
Total	4

[1] Forest impacts were determined through analysis of a hybrid forest data set comprised of forest delineated by the EEACs based off 2003 aerial photographs (includes groups of trees > 1 acre and wider than 120 feet) within the 2000 foot corridor and the 2011 NLCD set beyond the 2000 ft corridor and design right-of-way that extends beyond the corridor.
[2] Wetland totals do not include ponds or lakes

Conclusion

This Tier 1 BA Addendum for the northern long-eared bat for the Interstate 69 (Evansville to Indianapolis) project is being prepared to provide additional information on this species for the initiation of a Section 7 formal conference with the United States Fish and Wildlife Service (USFWS). The northern long-eared bat is expected to be federally listed.

This document includes the results of northern long-eared bat surveys, as well as the results of impact analysis for maternity colony foraging areas, the SAA, and hibernacula foraging areas within the WAA. Changes to the proposed action since the completion of the Tier 1 BA Addendum in March 7, 2006 are also discussed. It does not replace the original Tier 1 BA in 2003 nor Tier 1 BA Addendum in 2006; rather it supplements them with additional and revised information relating to the northern long-eared bat.

This Tier 1 BA Addendum includes the results of summer, autumn/spring, and winter surveys for the northern long-eared bat. Northern long-eared bat surveys completed as part of the I-69 project included mist netting during the summers of 2004, 2005, and 2008 to 2013 (8 years); harp trapping during the autumns of 2004 and 2005; cave surveys during the winters of 2004/2005 and 2005/2006; and harp trapping during the spring of 2005.

A total of 337 northern long-eared bats were captured from 101 of 189 surveyed mist net sites within the I-69 SAA in the summer in 2004, 2005 and 2008 to 2013. No radio-telemetry or emergence counts were completed since this species was not federally listed at the time of captures. Winter surveys from 2004-2006 identified 15 northern long-eared bats in caves; while harp trapping identified 1,015 northern long-eared bats.

As a result of the SAA surveys, 38 maternity colonies were identified by USFWS Bloomington Field Office (BFO) along the I-69 corridor. This includes two (2) colonies in Section 1, six (6) colonies in Section 2, eight (8) colonies in Section 3, nine (9) colonies in Section 4, nine (9) colonies in Section 5, and four (4) colonies in Section 6. Each maternity colony's foraging area is delineated by a circle with a radius of 1.5 miles.

A total of 55 northern long-eared bat hibernacula have been identified within the WAA. A northern long-eared bat hibernaculum is any cave/mine where a northern long-eared bat(s) have been found hibernating or was harp-trapped at a cave entrance. Each hibernaculum foraging area is delineated by a circle with a radius of 5 miles centered on the cave/mine entrance. showed the greatest number of northern long-eared bats identified in fall (2004) and spring (2005) harp trapping (at 277).

Direct, indirect, and cumulative analyses were completed for each maternity colony foraging area and northern long-eared bat hibernaculum foraging area. The analysis focused on impacts to forest, and was based on data developed specifically for this project. Direct impact analysis was not completed for Sections 1-4 since the project has been constructed in Sections 1-3 and tree clearing has been completed in Section 4. Direct impact analysis was completed for Sections 5 and 6.

Each maternity colony foraging area is 4,524 acres (approximately 7.1 square miles). Total forest impacts in the 38 maternity colonies, including direct, indirect, and cumulative, range from zero acres to 71 acres. This represents approximately zero to 1.6% of the total foraging area.

The entire WAA includes an area of 333,185 acres. Total forest impacts, including direct, indirect, and cumulative, for the entire WAA are 222 acres, or less than 0.1% of the total area. Each hibernaculum foraging area is 50,265 acres (78.5 square miles). Total forest impacts for each hibernaculum foraging area range from zero acres to 92 acres. This represents approximately zero to 0.2% of each individual hibernacula foraging area. The majority of the total forest cover impacts for all hibernaculum foraging areas are from anticipated indirect and cumulative development. Forest cover loss resulting from direct impacts associated with Section 5 and 6 highway construction are only 38 acres or 17% of the total forest cover loss.

The FHWA and the INDOT have reviewed the additional data presented in this addendum. Tier 2 BAs from FHWA and INDOT with returned BOs from USFWS have been received and approved in Sections 1-5. The only Tier 2 BA yet to be submitted for the project is in Section 6. FHWA and INDOT will consult with USFWS on specific impacts for Section 6 when the project is at the appropriate stage of development.

This document provides the results of all I-69 northern long-eared bats related surveys completed since the submission of the original Tier 1 BA. It also includes detailed analyses for direct, indirect, and cumulative impacts for the 38 identified maternity colonies and 55 known hibernacula within five miles of the I-69 corridor for the northern long-eared bat.

The information presented in this document is intended to aid in the assessment of impacts to the northern long-eared bats for the entire length of the I-69 project. Mitigation and minimization for impacts to this species are included in the Conservation Measures developed in consultation with USFWS and the purchased and yet to be acquired mitigations sites listed in this Tier 1 BA Addendum for the Northern Long-Eared Bat. Seventy-five mitigation sites are described in this Tier 1 BA Addendum that provide excellent habitat (both summer and winter) for the Indiana bat and the northern long-eared bat.

Mitigation efforts included purchasing 50 mitigation sites totaling approximately 5,528 acres (=8.6 square miles) in Sections 1-4. Twenty-five mitigation properties are currently being evaluated in Section 5 that equals at this time about 2,100 acres or about 3.3 square miles. INDOT and FHWA have also purchased 4 Indiana bat hibernacula that protect about 32,000 Indiana bats and an additional cave where the entrance has been modified to promote cooler temperatures in cave. Three of the above four purchased caves are also hibernacula for the northern long-eared bat (i.e.,) protecting many northern long-eared bats. In addition, the additional cave that had its entrance opened is a known hibernacula for the northern long-eared bat. Many of these are within or near the maternity colonies for both of these species. Due to similarities in the two species, FHWA and INDOT consider conservation measures suitable for the Indiana bat to be similarly suitable for the northern long-eared bat.

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Literature Cited

Adam, M. D. and J.P. Hayes. 2000. Use of Bridges as Night Roosts by Bats in the Oregon Coast Range. Journal of Mammalogy, 81(2): 402-407.

Amelon, S., and D. Burhans. 2006. Conservation assessment: *Myotis septentrionalis* (northern long-eared bat) in the eastern United States. Pages 69-82 in Thompson, F. R., III, editor. Conservation assessments for five forest bat species in the eastern United States. U.S. Department of Agriculture, Forest Service, North Central Research Station, General Technical Report NC-260. St. Paul, Minnesota. 82 pp.

Arnett, E. B., and J. P. Hayes. 2000. Bat use of roosting boxes installed under flat-bottom bridges in western Oregon. Wildlife Society Bulletin 28:890–894.

Barbour, R. W. and W. H. Davis. 1969. Bats of America. The University of Kentucky Press, Lexington, Kentucky.

Brack, V. Jr. and J. O. Whitaker, Jr. 2001. Foods of the northern myotis, *Myotis septentrionalis*, from Missouri and Indiana, with notes on foraging. Acta Chiropterologica 3(2):203-210

Bryan, Hal D., Rebecca D.M. Smith, Gary W. Libby, James E. Spencer, and P. Lee Droppelman. 2004. Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland Region From Washington to Scotland, Indiana, December 2004 (Eco-Tech, Inc.)

Caceres, M. C., and M. J. Pybus. 1997. Status of the northern long-eared bat (*Myotis septentrionalis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 3, Edmonton, AB.

Caceres, M. C., and R. M. R. Barclay. 2000. MYOTIS SEPTENTRIONALIS. Mammalian Species No. 634:1-4.

Caire, W., R. K. LaVal, M. L. LaVal, and R. Clawson. 1979. Notes on the ecology of MYOTIS KEENII (Chiroptera, Vespertilionidae) in Eastern Missouri. Amer. Midl. Nat. 102(2):404-407.

Carter, Timothy C. and G. Feldhamer. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. Forest Ecology and Management 219 (2005) 259–268.

Cervone, Thomas H., Rusty K. Yeager and Joe Dabkowski. 2012. I-69 pre-construction/construction period mist netting survey for the Indiana bat (*Myotis sodalis*) (Greene and Monroe Counties, Indiana) in the Lower White River Watershed. 19 December 2012 (Bernardin, Lochmueller and Associates, Inc.

Cervone, Thomas H., Rusty K. Yeager and Joe Dabkowski. 2011. I-69 pre-construction mist netting survey for the Indiana bat (*Myotis sodalis*) at Site 18 (Greene County, Indiana) in the Lower White River Watershed. 17 January 2012 (Bernardin, Lochmueller and Associates, Inc.)

Cervone, Thomas H., Rusty K. Yeager and Joe Dabkowski. 2011. Pre-construction Mist netting for the Indiana bat (*Myotis sodalis*) for Sites 2, 3, 8, 11 and 14 from US 231 to SR 5 Lower White River Watershed in Section 4 (Greene county, IN) (Bernardin, Lochmueller and Associates, Inc.)

Cervone, Thomas H., Rusty K. Yeager and Joe Dabkowski. 2013. I-69 pre-construction/construction period mist netting survey for the Indiana bat (*Myotis sodalis*) (Greene and Monroe Counties, Indiana) in the Lower White River Watershed. 11 December 2013 (Bernardin, Lochmueller and Associates, Inc.)

Clarkston, Valerie, Jason P. Damm, Dale W. Sparks and Virgil Brack, Jr. 2014. I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 - 2013 1st year post-construction survey and Sections 2 and 3 - 2013 1st year post-construction surveys. 6 January 2014 (Environmental Solutions & Innovations, Inc.)

Clarkston, Valerie, Dale W. Sparks and Virgil Brack, Jr. 2012. I-69 Mist netting survey for the Indiana bat (*Myotis sodalis*) 2012 – Section 5 Bloomington to Martinsville. 18 June 2012. (Environmental Solutions and Innovations, Inc.)

Cope, J.B. and S.R. Humphrey. 1972. Reproduction of the bats MYOTIS KEENII and PIPISTRELLUS SUBFLAVUS in Indiana. 13:9-10.

Davis R. and E.L. Cockrum. 1963. Bridges Used as Day Roosts by bats. Journal of Mammalogy, 44: 428-430.

Department of the Interior (Fish and Wildlife Service). 2013. Federal Register. Endangered and Threatened Wildlife and Plants: 12-month Finding on a Petition To List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species; Proposed Rule. Volume 78, No. 191 (October 2, 2013), Part III. 50 CFR Part 17.

Duchamp, J. E., D. W. Sparks, and J. O. Whitaker, Jr. 2004. Foraging- habitat selection by bats at an urban-rural interface: comparison between a successful and a less successful species. Canadian Journal of Zoology, 82:1157-1164.

Duffey, Jason A. and Virgil Brack, Jr. 2005: Autumn, Winter, and Spring Habitat for the Indiana Bat (*Myotis sodalis*) Within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana, September 7, 2005 (Environmental Solutions & Innovations, Inc.)

Duffey, Jason A. Jeffrey A. Hawkins, and Virgil Brack, Jr. 2006. Autumn 2005 and Winter 2006 Habitat for the Indiana Bat (*Myotis sodalis*) Within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana. (Environmental Solutions & Innovations, Inc.)

Easterla, D. A. 1968. Parturition of Keen's Myotis in Southwestern Missouri. Journal of Mammalogy 49(4):770.

Erickson, G. A. 2002. Bats and bridges technical bulletin (Hitchhiker's guide to bat roosts). California Department of Transportation, Division of Env. Analysis, Sacramento, California.

Faure, P. A., J. H. Fullard, J. W. Dawson. 1993. The gleaning attacks of the Northern long-eared bat, Myotis septentrionalis, are relatively inaudible to moths. Journal of Experimental Biology 178:173-189.

Feldhamer, G. A., T. C. Carter, J. O. Whitaker Jr. 2009. Prey Consumed by Eight Species of Insectivorous Bats from Southern Illinois. The American Midland Naturalist 162(1):43-51.

Ferrara, F.J. and P.L. Leberg. 2005. Influences of investigator disturbance and temporal variation on surveys of bats roosting under bridges. Wildlife Society Bulletin 33(3): 1113-1122.

Foster, R. W. and A. Kurta. 1999. Roosting ecology of the Northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80(2):659-672.

French, T. 2012. Phone Conversation between T. French, Wildlife Biologist, Massachusetts Division of Wildlife and Fisheries and J. Utrup, USFWS Green Bay Field Office (January 3, 2012).

Goehring, H. H. 1954. *Pipistrellus subflavus obscurus, Myotis keenii*, and *Eptesicus fuscus fuscus* hibernating in a storm sewer in central Minnesota. Journal of Mammalogy 35(3):434-436.

Gormanson, Dale D. 2014. Forest of Indiana, 2013. Resource Update FS-8. Newtown Square, PA: USDA, Forest Service, Northern Research Station. 4 p.

Griffin, D. R. 1940. Reviewed notes on the life histories of New England cave bats. Journal of Mammalogy 21(2):181-187.

Griffin, D. R. 1945. Travels of banded cave bats. Journal of Mammalogy 26(1): 15-23.

Hall, J. S., R. J. Cloutier and D. R. Griffin. 1957. Longevity records and nothes on tooth wear of bats. Journal of Mammalogy 38 (3): 407-409

Hendricks, William D., Rebecca D. Ijames, Leland Alverson, Michael Muller, John Timpone and Nate Nelson. 2004. Summer habitat for the Indiana Bat (*Myotis sodalis*) within the Martinsville Hills from Martinsville to Indianapolis, Indiana, December 15, 2004 (Ecological Specialties, LLC)

Henry, Amy B. and Russell C. Romme. 2006: Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana 2006, February 2006. (BHE Environmental, Inc.)

Henry, Amy A. and Russell Romme. 2006 Identification of Indiana Bat Roost Trees along the Proposed Interstate 69 between Bloomington and Indianapolis, Indiana, January 2006 (BHE Environmental, Inc.)

Henry, Amy B., Brooke A. Slack, Drew L. Crane and Russell C. Romme. 2005. Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana, September 2005. (BHE Environmental, Inc.)

Henry, Amy B. Ryan A. Slack and Russell C. Romme. 2004. Investigating Presence of the Indiana Bat during the Summer Maternity Season within the Mitchell Plain between Bloomington and Martinsville, Indiana, December 8, 2004 (BHE Environmental, Inc.)

I-69 Evansville to Indianapolis Project, Section 7 Consultation – 2013 Annual Report. January 22, 2014. Prepared by Bernardin, Lochmueller and Associates, Inc., Indianapolis, Indiana.

I-69 Evansville to Indianapolis Tier 2 Studies – Survey of Karst Features Report, Section 4, US 231 to SR 37 (Contains Confidential Information). June 2010. Prepared by Hydrogeology Incorporated from Bloomington, Indiana.

I-69 Evansville to Indianapolis Tier 2 Studies – Final Karst Feature and Groundwater Flow Investigation Report, Section 5, SR 37 south of Bloomington to SR 39. April 2013. Prepared by Ozark Underground Laboratory from Protem, Missouri.

IN.gov. 2007. INDOT. Accessed 12/12/07. http://www.in.gov/indot/2768.htm James, R.A. and B.K. Palmer. 2007. Baseline Surveys of Bridges and Modeling of Occupancy for Bats in California. Bat Research News, 2007.

Jaskula, Jeanette and Virgil Brack, Jr. 2004. Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Crawford Upland and Mitchell Plain from Scotland to Bloomington, Indiana, 13 December 2004 (Environmental Solutions & Innovations, Inc.)

Kath, J. 2012. Phone Conversation between J. Kath, Endangered Species Manager, Illinois Department of Natural Resources and J. Utrup, Fish and Wildlife Biologist, USFWS Green Bay, Wisconsin Field Office (January 12, 2012).

Kath, J. 2013. Email Communication sent by J. Kath, Endangered Species Manager, Illinois Department of Natural Resources to J. Utrup, Fish and Wildlife Biologist, USFWS Green Bay, Wisconsin Field Office (April 9, 2013).

Keeley, B.W. and M.D. Tuttle. 1999. Bats in American Bridges. Bat Conservation International.Kiser, J.D., J.R. McGreggor, H.D. Bryan and H. Howard. 2002. Use of Concrete Bridges as Night roosts. Pp. 208-215 in the Indiana Bat Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, Eds.). Bat Conservation International, Austin, Texas.

Krochmal, A. R. and D. W. Sparks. 2007. Timing of Birth and Estimation of Age of Juvenile *Myotis septentrionalis* and *Myotis lucifugus* in West-Central Indiana. Journal of Mammalogy 88(3):649-656

Kunz, T. H. 1971. Reproduction of Some Vespertilionid Bats in Central Iowa. American Midland Naturalist 86(2):477-486

Kudlu, Priya and Virgil Brack, Jr. 2005. Additional Telemetry and Roost Studies of the Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland, Crawford Upland, and Mitchell Plain Regions From Elberfeld to Bloomington, Indiana, 14 September 2005 (Environmental Solutions & Innovations, Inc.)

Kurta, A. and J. A. Teramino. 1994. A novel hibernaculum and noteworthy records of the Indiana bat and eastern pipistrelle (Chiroptera: Vespertilionidae). American Midland Naturalist 132(2):410-413

Kurta, A. 1995. Mammals of the Great Lakes region, revised edn. University of Michigan Press, Ann Arbor, MI. 376 pp.

Lacki, M. J. and J. H. Schwierjohann. 2001. Day-Roost Characteristics of Northern Bats in Mixed Mesophytic Forest. The Journal of Wildlife Management 65(3):482-488

Lance, R.F., B.T. Hardcastle, A. Talley and P.L. Leberg. 2001. Day-roost Selection by Rafinesque's Big-eared Bats (*Corynorhinus rafinesquii*) in Louisiana Forests. Journal of Mammalogy, 82(1): 166-172.

LaVal, R. K., R. L. Clawson, M. L. LaVal and W. Caire. 1977. Foraging Behavior and Nocturnal Activity Patterns of Missouri Bats, with Emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis.* Journal of Mammalogy 58(4):592-599

Leftwich, Chris, Jeanette Jaskula, Jason Duffey and Virgil Brack, Jr. 2004. Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland Region from Elberfeld to Oakland City, Indiana, December 13, 2004 (Environmental Solutions & Innovations, Inc.)

Mann, Adam, Jo Garofalo and Virgl Brack, Jr. 2009. I-69 Section 1: Pigeon Creek maternity colony 2009 post-construction mist netting survey for the Indiana bat (*Myotis sodalis*). 23 November 2009 (Environmental Solutions & Innovations, Inc.)

Mann, Adam, Jeanette Jaskula, Jason Duffey and Virgil Brack, Jr. 2004. Summer Habitat for the Indiana Bat (*Myotis sodalis*) Within the Wabash Lowland Region from Oakland City to Washington, Indiana, December 13, 2004 (Environmental Solutions & Innovations, Inc.)

Menzel, M. A., S. F. Owen, W. M. Ford, J. W. Edwards, P. B. Wood, B. R.Chapman, and K. V. Miller. 2002. Roost tree selection by northern long-eared bat (*Myotis septentrionalis*) maternity colonies in an industrial forest of the central Appalachian mountains. ForestEcology and Management 155:107-114.

Mumford R. E., and J. B. Cope. 1964. Distribution and status of the chiroptera of Indiana. American Midland Naturalist 72(2):473-489.

Nagorsen, D. W., and R. M. Brigham. 1993. The Mammals of British Columbia. 1. Bats. Royal British Columbia Museum, Victoria, and the University of British Columbia Press, Vancouver. pp. 164

Owen, S. F., M. A. Menzel, W. M. Ford, J. W. Edwards, B. R. Chapman, K. V. Miller, and P. B.Wood. 2002. Roost tree selection by maternal colonies of Northern long-eared Myotis in an intensively managed forest. USDA Forest Service. Newtown Square, Pennsylvania.

Perry, R. W., and R. E. Thill. 2007. Roost selection by male and female northern long-eared bats in a pine-dominated landscape. Forest Ecology and Management 247:220-226.

Pfeffer, Erin and Virgil Brack, Jr. 2008. I-69 Section 1: Pigeon Creek maternity colony pre-construction mist netting survey for the Indiana bat (*Myotis sodalis*). 16 December 2008 (Environmental Solutions & Innovations, Inc.)

Ratcliffe, J. M. and J. W. Dawson. 2003. Behavioral flexibility: the little brown bat, *Myotis lucifugus*, and the northern long-eared bat, *M. septentrionalis*, both glean and hawk prey. Animal Behaviour 66:847-856.

Sandel, J.K., G.R. Benatar, K.M. Burke, C.W. Walker, T.E. Lacher, Jr. and R.L. Honeycutt. 2001. Use and selection of winter hibernacula by eastern pipistrelle in Texas. Journal of Mammalogy, 82(1): 173-178.

Sasse, D.B. and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats *(Myotis septentrionalis)* in the white mountain national forest. Bats and Forests Symposium October 1995, Victoria, British Columbia, Canada, p.91-101.

Sparks, Dale, Lisa Winhold and Virgil Brack, Jr. 2011. I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 - 2010 2nd year post-construction survey and Sections 2 and 3 - 2010 pre-construction surveys. 14 February 2011 (Environmental Solutions & Innovations, Inc.)

Sparks, Dale W., Jason A. Duffey and Virgil Brack, Jr. 2012. I-69 Mist Netting Survey for the Indiana bat (Myotis sodalis) Section 1 - 2011 3rd year construction survey and Sections 2 and 3 - 2011 1styear construction surveys. 13 February 2012 (Environmental Solutions & Innovations, Inc.)

Sparks, Dale W., Valerie Clarkston and Virgil Brack, Jr. 2012. I-69 Mist Netting Survey for the Indiana bat (*Myotis sodalis*) Section 1 - 2012 4th year construction survey and Sections 2 and 3 - 2012 2nd year construction surveys. 3 August 2012 (Environmental Solutions & Innovations, Inc.)

Timpone, J. C., Boyles, J.G., Murray, K.L., Aubrey, D.P., and L.W. Robbins. 2010. Overlap in roosting habits of Indiana Bats (*Myotis sodalis*) and northern bats (*Myotis septentrionalis*). American Midland Naturalist, 163:115-123.

U.S. Fish and Wildlife Service (USFWS). 2014. Northern Long-eared Bat Interim Conference and Planning Guidance. USFWS Regions 2, 3, 4, 5 and 6. January 6, 2014. 10 pp. Appendices A - I.

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

van Zyll de Jong, C. G. 1979. Distribution and systematic relationships of long-eared Myotis in western Canada. Canadian Journal of Zoology, 57: 987-994.

van Zyll de Jong, C. G. 1985. Handbook of Canadian Mammals 2: Bats. National Museums of Canada, Ottawa, ON. 212 pp.

Weather Underground. Accessed 1/03/08. http://www.weatherunderground.com/cgibin/findweather/getForecast

Whitaker, J.O. and W.J. Hamilton. 1998. Mouse-eared bats, Vespertilionidae. P. 89-102. In *Mammals of the eastern United States, Third Edition.* Comstock Publishing Associates, a Division of Cornell University Press, Ithaca, New York.

Whitaker, J.O. and L.J. Rissler. 1992. Seasonal activity of bats at copperhead cave. Proceedings of the Indiana Academy of Science, 101: 127-134.

Whitaker, J. O., Jr., D. W. Sparks, and V. Brack, Jr. 2004. Bats of the Indianapolis International Airport Area, 1991-2001. Proceedings of the Indiana Academy of Science 113:151-161

Whitaker, J.O., V. Brack, Jr., D.W. Sparks, J.B. Cope and S. Johnson. 2007. Bats of Indiana. Terre Haute, Indiana. Indiana State University, Center for North American Bat Research and Conservation.

Whitaker, J.O. and R.E. Mumford. 2009. Northern Myotis. P. 207-214. In *Mammals of Indiana*. Indiana University Press, Bloomington, Indiana.

Whitby, J.E., P.R. Heaton, E.M. Black, M. Wooldridge, L.M. McElhinney and P. Johnstone. 2000. First isolation of a rabies-related virus from a Daubenton's bat in the UK. The Veterinary Record 147(14): 385-388.

Willis, C. K. R., J. W. Jameson, P. A. Faure, J. G. Boyles, V. Brack and T. Cervone. 2009. Thermocron iButton and IBBat temperature dataloggers emit ultrasound. Journal of Comparative Physiology B Biochemical Systemic and Environmental Physiology. Volume 179:867-874

Winter Action Area: I-69 Evansville to Indianapolis Tier 2 Studies Cave Reconnaissance for Indiana Bat Hibernacula, October 2005 – (Indiana Geological Survey)

APPENDIX A

Agency Coordination

DRAFT MEETING MINUTES

I-69 Northern Long-Eared Bat Meeting

United States Fish and Wildlife Service – Bloomington Field Office (BFO)

Wednesday, April 9, 2014 at 10:00 a.m. to 1:00 p.m. EDT

Attendees	Organization
Scott Pruitt	United States Fish and Wildlife Service (USFWS)
Robin McWilliams	United States Fish and Wildlife Service (USFWS)
Jennifer Okajima	United States Fish and Wildlife Service (USFWS)
Michelle Allen	Federal Highway Administration (FHWA)
Sandra Flum	Indiana Department of Transportation (INDOT)
Laura Hilden	Indiana Department of Transportation (INDOT)
Steve Sperry	Indiana Department of Transportation (INDOT)
Jason DuPont	Bernardin, Lochmueller and Associates, Inc.
Tom Cervone	Bernardin, Lochmueller and Associates, Inc.
Rusty Yeager	Bernardin, Lochmueller and Associates, Inc.

Representatives from INDOT, FHWA, USFWS and Bernardin Lochmueller and Associates, Inc. met on April 9, 2014 at the USFWS (Bloomington Field Office). The purpose of the meeting was to:

- discuss initiation of the conferencing process for the northern long-eared bat,
- discuss amending the I-69 Tier 1 BO and Tier 2 BOs as necessary for the northern long-eared bat,
- present current data available on the northern long-eared bat,
- provide an update on current and proposed tree clearing in Sections 1 through 4 and Section 5,
- summarize forest impacts in Section 5,
- summarize and discuss the mitigation efforts proposed for the Indiana bat in terms of suitability as mitigation for the northern long-eared bat, and
- establish a clarification as to the scope and level of effort anticipated to conduct 2014 summer bat surveys in Sections 1 through 6.

The meeting is summarized as follows.

<u>Northern Long-Eared Bat Conferencing</u>

USFWS provided clarification that coordination with the Service concerning the northern long-eared bat does not constitute re-initiation of Section 7 consultation since it does not involve the Indiana bat, but should be viewed as initiation of consultation another species. As part of the conferencing process, INDOT/FHWA would prepare a biological assessment as if the species were listed which provides a determination of affect (i.e., “likely to adversely affect”). Submittal of the BA and requesting conference opinion would initiate the conferencing process with the USFWS on the northern long-eared bat. USFWS would prepare a Conferencing Opinion that would only make a determination of jeopardy/non-jeopardy since the species is not currently listed. However, because it is the desire of FHWA/INDOT to have a seamless transition between the pre-listing Conferencing Opinion and the post-listing Biological Opinion, FHWA/INDOT can request a “take statement” for the northern long-eared bat in the initiation letter. The Service would in turn draft a conferencing “take statement” which would become a part of the Biological

Opinion once the species is listed. The 135 day review period does not apply to the conferencing process. However, USFWS would anticipate completing the conference report within that time period, and most likely by mid to late summer.

An overall Tier 1 Conferencing Opinion for the northern long-eared bat will be prepared by the USFWS and later designated as a Tier 1 Biological Opinion and included as an amendment to the original Tier 1 Biological Opinion which can then be referenced in the Tier 2 Section 5 amendment. Tier 1 and Section 5 Tier 2 amendments will be concurrent. The Tier 2 amendment is believed to be needed since all of the trees in Section 5 have not yet been cleared. Nonetheless, USFWS will investigate if the amendment is actually needed for Section 5 if it is covered in Tier 1.

It is anticipated that USFWS will make a decision on the northern long-eared bat listing sometime in mid-October.

FHWA inquired as to how other states were handling the northern long-eared bats. USFWS responded that they were aware similar discussions were going on in other states (specifically Illinois), but had no knowledge as to how the issue was being resolved elsewhere, and only supposed that it was probably being handled in a manner similar to how Indiana was addressing the process.

Conferencing on I-69, Ohio River Bridges and SR 641 will likely be simultaneous. USFWS requests that FHWA/INDOT prioritize these projects. INDOT indicated that I-69 has been given priority over other projects in terms of coordinating with USFWS on conferencing for the northern long-eared bat. July-August is tentatively targeted for completion/submittal of the conferencing report. USFWS suggests titling the conferencing report as just a Biological Assessment and submitting it as soon as possible.

USFWS clarified that a lead office for the northern long-eared bat has not yet been identified and it is not the BFO.

Additional Species Listings

Little brown bats were previously thought to be on the same track as the northern long-eared bats in terms of consideration for endangered species listing. This is no longer the case, but the population status of the species is still being reviewed. Listing of the little brown bat is not anticipated to occur within the next year, but possibly any time after that by USFWS.

Tree Clearing

Habitat impacts in Section 5 are still occurring. Although right-of-way tree clearing impacts in Section 4 have already taken place, there are still instances where occasional small area tree clearing is being needed for grading limit adjustments due to field conditions. Ample mitigation has been developed for all impacts documented in the BA/BO for each section. However, since actual impacts were less than that anticipated, additional mitigation exists for any new areas that need to be cleared. The Section 4 BA accounted for 1,107 acres of tree clearing impact. Actual clearing is around 1,070 acres based on the final right-of-way and even less based on construction limits (897 acres).

Tree clearing in the southern end of Section 5 has been completed and road construction is anticipated to commence in August. How much clearing will be completed this year is currently undetermined, but from October 1, 2014 to March 31, 2015, all clearing in Section 5 should be completed

USFWS inquired as to the status of the tree clearing schedule for Section 6. It was identified that there is a plan to move forward with Section 6 following completion of Section 5, but there is currently no set schedule defined. It was noted that 18 months to 2 years is needed to complete the environmental process, and as such, it would not be likely that Section 6 clearing would begin before 2017 as suggested by USFWS. Additionally, USFWS inquired as to if the location of the Section 6 alignment was known. FHWA indicated that at this time, it is still expected to follow the current route identified within the Tier 1 corridor, but that this is subject to change pending further coordination with project partners and review of current conditions in the evaluation process.

Forest Impacts

The BA/BO identified a total of 350 acres of forest impacts in Section 5 including right-of-way, utilities and billboards. It was clarified that the right-of-way acreage was reduced from 255 down to 206 acres in the FEIS due to right-of-way adjustments. Utilities were estimated at 75 acres originally and will likely be reduced to 50 acres or even down to the 30 to 40 acre range depending on final alignment for the gas transmission line relocation. Anticipated total forest impacts are now estimated at 250 to 270 acres. Approximately 60 acres have currently been cleared from southern terminus to Griffey Creek. Some utility clearing has taken place north of Griffey Creek. At present, approximately one-quarter of the forest impacts anticipated for Section 5 have occurred and includes all of the winter action area with the exception of possible small parcels where right-of-way was not secured yet. Clearing is to resume after October 1, 2014 and the expectation is that all Section 5 clearing will be completed by March 31 2015. Minimal additional clearing will likely be realized through 2016 and 2017 to address potential construction issues. USFWS confirmed their understanding that the acreage for these potential additional clearings would be within the final right-of-way and covered within the original prediction of forest impact. USFWS also acknowledged that the required mitigation acreage is based on the final right-of-way forest as opposed to the BA/BO estimated forest acreage.

I-69 Indiana Bat and Northern Long-eared Bat Summary

Findings of the bat data collected for the Indiana bat and northern long-eared bat from 2004 to the present was provided to the team. Generally, it included the following data:

- surveyed monthly for six years
- Summer mist netting and fall/winter harp trap and cave census surveys
- Section 5 comparison between 2004 and 2012
- Subset monitoring of 2004 mist netting sites from 2008 to present in Sections 1 through 4
- 18,000 to 19,000 bats surveyed throughout history of project
- 16 established Indiana bat maternity colonies
- Northern long-eared bat roost tree data not available
- Northern long-eared conceptual maternity colony limits determined based on 3 mile radius of reproductive female and juvenile bat captures
- Significant overlap of Indiana bat maternity colony limits and conceptual maternity colony limits

- 87 percent of sites with Indiana bat captures also had northern long-eared bat captures.
- Identification of potential northern long-eared bat area of occupancy east of SR 37 south of Martinsville where potential colony(ies) might occur.
- Mitigation purchased for the Indiana bat was considered beneficial for the northern long-eared bat

Northern Long-eared Bat Conferencing BA

FHWA and INDOT asked USFWS what additional analysis would be needed for the conferencing BA for the northern long-eared bat in addition to that which has been done to date based on the existing data from 2004 through 2013. Should landscape analysis similar to that done for the Indiana bat be conducted for the northern long-eared bat based on capture locations in the absence of roost data? Is it necessary to conduct landscape analysis for the northern long-eared bat in Sections 1 through 4 since the habitat impacts have already occurred?

USFWS stated that, as was done for the Indiana bat, the Service would take the available data for the northern long-eared bat and determine the location and limits of colonies to be used for the Tier 1 BA amendment and that the same level of analysis should be conducted for the northern long-eared bat as was done for the Indiana bat. Discussion reiterated the methods whereby Indiana bat colony centroids were located (i.e., primary roost, centroid of multiple secondary roosts, or capture location in the absence of roost identification).

FHWA confirmed that the colonies established for the northern long-eared bat will utilize a 1.5 mile radius. Additionally, USFWS clarified that the northern long-eared bat colonies will be determined independent of the Indiana bat colony locations. As such, overlap of maternity colony limits between the two species is expected. USFWS also indicated that some overlap between adjacent northern long-eared bats is possible, but that they wouldn't be stacked on top of each other.

At the suggestion of the USFWS, FHWA/INDOT agreed to facilitate and expedite the analysis of existing data for the purposes of determining the working northern long-eared bat colony locations. It was agreed in the meeting that USFWS could coordinate directly with Bernardin Lochmueller for the exchange of data. Bernardin Lochmueller agreed to provide all existing data used to generate the graphics presented at the meeting available to the USFWS. If keyhole markup language or keyhole markup language zip files (KML or KMZ) are preferable, Bernardin Lochmueller would prepare the requested data in this format for use with Google Maps.

Mitigation

FHWA inquired as to if the mitigation (forest planting, forest preservation, cave preservation) developed and/or proposed for the Indiana bat will also be considered as mitigation for the northern long-eared bat given their similar habitat affinities. USFWS indicated that this is a recurring question they are currently working through and that they will provide additional guidance. USFWS hypothesized that because all forest habitat has a carrying capacity in terms of available foraging habitat, insect food source, etc., that combined mitigation for both species may not be at a 1:1 ratio (i.e., 1 acre of mitigation serves as both 1 acre of mitigation for the Indiana bat and 1 acre of mitigation for the northern long-eared bat), but that some methodology will be developed by the Service to determine the mitigation needs of each species and how much mitigation overlap would be permissible. USFWS anticipates that the guidance will establish criteria to ensure that mitigation for both species is covered, but will have enough flexibility to allow for achieving this target goal through various scenarios.

USFWS noted that impacts to the northern long-eared bat habitat are expected to be small for Section 5 since this occurs along existing highway alignment.

Additional acreage of forest habitat to be acquired as excess land for the purchase of access rights in the Bryants Creek and Cooksey Lane area will generate additional mitigation acreage beyond the area previously provided during the previous agency review.

INDOT noted that the sooner the USFWS can provide a directive on how mitigation for the northern long-eared bat will need to be handled, the better chance there is of preserving the construction schedule for Section 5. USFWS indicated that the species composition of trees to be used for mitigation plantings is not likely to differ from that which has been acceptable for the Indiana bat. Because it is anticipated that the Section 5 BA for the northern long-eared bat will be completed and submitted prior to the USFWS issuing formal guidance on how mitigation is to be handled for this species in conjunction with mitigation for the Indiana bat, it was the FHWA recommendation that the BA identify the amount of mitigation available beyond that needed for the Indiana bat in Section 5 and designate this for USFWS consideration as mitigation for the northern long-eared bat.

Bernardin Lochmueller questioned if excess forest mitigation in Section 4 at Plummer Creek could be used as mitigation in Section 5 for the northern long-eared bat. USFWS suggested that this might be acceptable provided a sound rationale is provided.

2014 Survey Efforts

Mist netting in Sections 1 through 4 would continue as in past years. USFWS was questioned as to if they saw a need to possibly relocate Site 21 in Section 4 due to poor capture rates over the past two years. USFWS will discuss this and coordinate with Bernardin Lochmueller at a later date.

In Section 5, originally seven locations were selected for conducting annual pre-construction /post-construction monitoring based on Indiana bat captures or favorable capture rates of other bat species. The combined 2004 and 2012 date now yields a total of eight capture sites for the Indiana bat. Surveying of eight sites in Section 5 would potentially mean a reduction of sampling sites in Section 6 to maintain the pre-agreed cap of 50 sites for all of I-69. USFWS requested additional time to review the data presented and coordinate with Bernardin Lochmueller at a later date as to if the current recommendation for eight sites based on Indiana bat captures is acceptable or if site selection needs to be adjusted to include additional potential northern long-eared bat captures.

In Section 5, USFWS indicated that it is important to track northern long-eared bats to roosts since there is no previous documentation of this resource utilization for the species on this project. Bernardin Lochmueller indicated that the I-69 surveys in 2014 were a priority for ESI and Bernardin Lochmueller, and if it was desirable to generate northern long-eared data as soon as possible, Section 5 could commence in mid-May dependent upon proper weather conditions.

FHWA voiced concern about the potential of capturing a northern long-eared bat and tracking it to a roost within the proposed right-of-way where clearing is required. This is of particular concern since tree clearing will be on-going for the next few years. USFWS indicated that tracking is not required, but that this information would be valuable in the consultation process and potential mitigation opportunities. Any northern long-eared bat roosts identified within the right-of-way would be handled in a manner similar to the Indiana bat roost located in Section 4 in 2010. USFWS noted the probability was low since the species is more of an interior woodland bat and much of what is to be cleared in Section 5 is woodland fringe habitat.

The project standard operating procedure for tagging and tracking endangered bats was clarified. The first reproductive female of each species captured at each site would be tagged and tracked, but any subsequent individuals of that species captured at the same site would not be tagged and tracked. In the event that very few or no reproductive female or juveniles are being captured and there are only a few sites remaining, it would be at the researcher's discretion to tag and track any males of either species.

USFWS confirmed that tagging and tracking would not be required for northern long-eared bats captured, regardless of gender or reproductive condition, for Sections 1 through 4.

USFWS reiterated that for Section 6, the new protocol for presence or absence will need to be followed and this could result in the need to add more survey sites. It was noted that in 2004, there were 29 sites surveyed in Section 6, each for two nights and that based on the current Indiana bat protocol of 4 net nights per km of suitable summer habitat, that the previous level of effort might be sufficient. This will need to be investigated and confirmed prior to survey work on Section 6 in the event additional sites/nights are needed.

For Sections 1 through 4, northern long-eared bat indirect and road-kill analysis is all that is required for Tier 1. For Section 5 landscape habitat analysis within the northern long-eared bat colonies will be conducted, in addition to proximity/connectively analysis. USFWS offered the option to only do the analysis relative to colonies north of Site 6 (Beanblossom area) since the southern end has already been cleared.

It was noted that acoustic data has been collected each year that the monitoring has been conducted from 2008 to the present, but that 2013 represented the first year that acoustic analysis of the data was conducted. BCID and EchoClass automated software was used to identify potential Indiana bat and gray bat calls, and any such potential calls were visually inspected to either confirm or reject the automated software prediction. Bernardin Lochmueller indicated that any potential northern long-eared bat calls resulting from the software predictions would also be visually reviewed in 2014 and included within the Section 5 Mist Netting Report. Confirmation from USFWS is needed to determine if visual confirmation of northern long-eared bat calls resulting from automated program identification in Sections 1 through 4 is necessary.

The following is a synopsis of 2014 field survey expectations.

- Mist net 41 sites in Sections 1, 2, 3, 4 and 5. No mist netting in Section 6.
- Radio telemetry, roost identification and emergence counts for Indiana bat in Sections 1, 2, 3, 4 and 5.

- Radio telemetry, roost identification and emergence counts for northern long-eared bat in Section 5 only.
- Radio telemetry criteria for northern long-eared bat same as Indiana bat. First reproductive female or juvenile at each capture site. Tag and track adult males only on second night if reproductive females and juveniles are not available.
- Acoustic identification and visual analysis of possible Indiana bat, gray bat and northern long-eared bat call sequences in Sections 1, 2, 3, 4 and 5.

The meeting was adjourned at approximately 1:00 pm EDT.

From: Flachskam, Jill K [mailto:JFlachskam@dnr.IN.gov]
Sent: Thursday, May 29, 2014 8:14 AM
To: Townsend, Daniel
Cc: Stacy, Mark A
Subject: bat surveys

Hello Daniel,

The data for the bat surveys at the sites of interest is attached. The first tab includes trapping data by species, and the second tab includes the presence/absence surveys. I also attached a shapefile that distinguishes the different points at each site and also identifies the type of reclamation (angle iron gate or gated culvert). Most of the points were located from aerial photos, so they may be a little off but they should be close. Let me know if you need anything else!

Jill Flachskam
GIS Inventory Specialist
Indiana Department of Natural Resources
Division of Reclamation

From: Townsend, Daniel [mailto:DTownsend@lochgroup.com]
Sent: Tuesday, May 20, 2014 10:25 AM
To: Stacy, Mark A
Cc: Flachskam, Jill K
Subject: RE: Coal Mine Information

Mark,

The AML site number for the locations we are interested in additional bat data are:

-
-
-
-

Thank you for your time and assistance,
Daniel

Daniel Townsend, **EI**
GIS Manager

812.759.4116 (direct)
812.459.3415 (mobile)
DTownsend@lochgroup.com

From: Stacy, Mark A [mailto:mstacy@dnr.IN.gov]
Sent: Tuesday, May 20, 2014 8:55 AM
To: Townsend, Daniel
Cc: Flachskam, Jill K
Subject: RE: Coal Mine Information

Daniel,

Unfortunately, we probably don't have much data on these mine sites because we typically only do a absence/presence survey, and then install bat friendly closures when we find bats of any kind. But there have been a few sites that we've trapped and do have bat species data. There should be an AML site number associated with each of the points. Just let me know what the site numbers are that you're interested in, and I'll see what data we have.

Thanks – Mark

Mark Stacy, CEP
Environmental Specialist/Tech. Mgmt. Supervisor
Indiana Department of Natural Resources
Division of Reclamation
Abandoned Mine Lands Program
14619 West State Road 48
Jasonville, IN 47438-7056
812-665-2207 (Office)
812-699-7892 (Mobile)

From: Stacy, Mark A [mailto:mstacy@dnr.IN.gov]
Sent: Wednesday, May 14, 2014 10:42 AM
To: Cervone, Tom
Cc: Townsend, Daniel
Subject: Coal Mine Information

Tom,

Here is the link to the Coal Mine Information System's website as per your request. As I mentioned, this website is administered for us by the Indiana Geological Survey. If you have any questions about the site or data, feel free to contact Becky Meyer, who is the current CMIS Program Director. (reameyer@indiana.edu)

Also, attached is the shapefile of all bat gates that the Indiana AML Program has installed.

Please let me know if you need anything else.

Mark Stacy, CEP
Environmental Specialist/Tech. Mgmt. Supervisor
Indiana Department of Natural Resources
Division of Reclamation
Abandoned Mine Lands Program
14619 West State Road 48
Jasonville, IN 47438-7056

812-665-2207 (Office)
812-699-7892 (Mobile)

Opening	SurveyDate	Species	Males	Females
	6/12/1996	Myotis lucifugus	7	
	6/12/1996	Myotis septentrionalis	9	
	6/12/1996	Pipistrellus subflavus	2	
	6/12/1996	*bats heard but none trapped*		
	5/31/1996	Myotis lucifugus	19	
	5/31/1996	Myotis septentrionalis	4	
	5/31/1996	Pipistrellus subflavus	17	
	10/10/1996	Myotis lucifugus	18	
	10/10/1996	Myotis septentrionalis	4	
	10/10/1996	Myotis sodalis	2	
	10/10/1996	Pipistrellus subflavus	4	2
	1/2/1997	Myotis lucifugus	2	
	8/28/1997	Myotis lucifugus	13	
	8/28/1997	Myotis septentrionalis	2	
	8/28/1997	Pipistrellus subflavus	2	1
	6/12/1995	*bats heard but none trapped*		
	10/1/1998	Myotis lucifugus	2	
	9/16/1998	*bats heard but none trapped*		
	9/16/1998	Myotis septentrionalis	9	6
	9/16/1998	Pipistrellus subflavus	1	

Opening	SurveyDate	Result
	21-May-98	absent
	17-Sep-98	absent
	16-Jun-98	absent
	17-Sep-98	absent
	22-Sep-98	absent
	1-Jul-98	absent
	22-Sep-98	present
	22-Sep-98	present
	11-Sep-98	present
	6-Sep-01	present

Minutes for Conference Call
9 September 2014
10-11 a.m. (EDT)

The following minutes are offered for the 9 September 2014 conference call.

Attendees:	Robin McWilliams	USFWS
	Michelle Allen	FHWA
	Sandra Flum	INDOT
	Laura Hilden	INDOT
	Steve Sperry	INDOT
	Jason DuPont	Lochmueller Group
	Rusty Yeager	Lochmueller Group
	Tim Miller	Lochmueller Group
	Daniel Townsend	Lochmueller Group
	Tom Cervone	Lochmueller Group

The conference call began at 10 a.m. (EDT) with FHWA and INDOT introducing the purpose. They thanked USFWS for their comments on the Draft Tier 1 BA for the Northern Long-Eared Bat (NLEB). It was emphasized that the submittal was a DRAFT Tier 1 BA and submitted with the understanding that this species would be listed in October 2014. Nonetheless, the potential listing has been postponed by 6 months.

Currently, the Tier 1 BA Team is in the process of making revisions to the document per USFWS's comments. FHWA and INDOT asked also for comments on the Life History of which USFWS will send. It was suggested in an earlier meeting (July 2) that 2014 mist netting results be added to the end of the Summer Survey Section. Such information will be added.

A separate discussion was requested on Indirect and Cumulative Impacts in the Remaining Summer Action Area (RSAA). USFWS understood that in the earlier Tier 1 documents, analysis was not completed but it was in the Tier 2 documents. It was initially thought the Tier 2 documents could be reviewed and numbers added; however, after the conference call, Lochmueller Group found they could not add each up since the Summer Action Area and maternity colonies were different. USFWS was contacted after the conference call, and it was suggested that USFWS would discuss the merits of completing or not analysis for the RSAA used for the male NLEB.

Potential listing for the NLEB is expected by April 2, 2015, and FHWA and INDOT discussed with USFWS proposed tree clearing, blasting and hydrological connections. It was brought up in the meeting that possibly the language needs revised and that there be more of a clarification in some cases. In addition, FHWA's letter to USFWS needs revised to address the postponement and any appropriate statements or language related to tree clearing, blasting and/or hydrological connections.

It was reported in the conference call that tree clearing in Sections 1-4 is complete and tree clearing will be completed by March 31, 2015 in Section 5 (including utilities and frontage roads). Little change, if any, is anticipated in the Tier 1 BA for tree clearing.

Blasting was discussed with USFWS. The definition for hibernacula for the NLEB included those caves that showed this species in the cave and/or those harp trapped at the entrance(s). For the Indiana bat, only the former criterion was used. With both internal cave and harp trapping results as the criteria for the NLEB, 55 hibernacula with foraging areas were analyzed. With the more restrictive definition, only 14 caves were shown as hibernacula for the Indiana bat. With more hibernacula, 6 NLEB hibernacula were found 0.5 mile or less to the I-69 R/W.

To the best of INDOT's and FHWA's knowledge, the following is anticipated for these 6 hibernacula:

1. Blast in Fall 2014 for: Section 4
2. Blast in Fall 2014 for: Section 4
3. Blast in Fall 2014 for: Section 4
4. Blast (Late Summer or Fall) for: Section 4
5. Rip in summer for next 3 months for: Section 4
6. Rip (Non-Blast) for: Section 5

It was difficult for USFWS, INDOT and FHWA to visualize where these hibernacula were and their relative distance from the proposed action. For this reason and after the conference call, Lochmueller Group sent a map showing the location of these 5 caves in Section 4 and the 1 cave in Section 5.

Immediately after the conference call, Lochmueller Group emailed one map showing all 6 hibernacula, and also 6 individual maps of each hibernacula that show its extent with a 0.5 mile buffer from its entrance and from its mapped portions. In the original Tier 1, the conservation measure of avoiding blasting within 0.5 miles was from the entrance only. There were no Indiana bat hibernacula within 0.5 miles of the I-69 R/W.

USFWS thought blasting should be acceptable until the listing of the species, and suggested that and its schedule be confirmed, i.e., no blasting and blasting before April 2. USFWS will consult in-house on this subject and get back to FHWA and INDOT.

Best Management Practices in Soil Erosion and Sediment Containment near caves, and for caves would be applicable. The former two have hydrological connections, while the latter two may have indirect connections. FHWA and INDOT would continue to implement the 1993 Karst MOU.

The last topic was schedule. USFWS will speak in-house this week and get back with confirmation on tree clearing, blasting and hydrological connections. Two and ½ weeks (September 29) were thought sufficient to submit a Formal Tier 1 BA for the NLEB to USFWS. The meeting concluded at 11 a.m. (EDT).

APPENDIX B

Bat Occupancy under a bridge in southwestern Indiana

Bat Occupancy under a Bridge in Southwestern Indiana

Thomas Cervone[1], Jaime Sias Byerly[2], Rusty Yeager[1] and R. Andrew King[3]
[1]Bernardin, Lochmueller and Associates, 6200 Vogel Road, Evansville, IN 47715
[2]Bernardin, Lochmueller and Associates, 3502 Woodview Tr., Ste. 150, Indianapolis, IN 46268
[3]United States Fish and Wildlife Service, 620 South Walker Street, Bloomington, IN 47403
Email: tcervone@blainc.com

Abstract

During the course of an Indiana Department of Transportation (INDOT) highway study in 2004 and 2005, over 200 bridges and culverts were surveyed for bats, but only one bridge (referred to as "the occupied bridge" or simply "the bridge") was found to have roosting Indiana bats (*Myotis sodalis*) and gray bats (*Myotis grisescens*), both federally endangered species. Other species roosting under the same bridge included little brown bats (*Myotis lucifugus*), big brown bats (*Eptesicus fuscus*) and tri-colored bats (*Pipistrellus subflavus*). Two red bats (*Lasiurus borealis*) were also captured along the side of this bridge.

Formal surveys of the occupied bridge included 118 visits from 13 October 2006 to 3 April 2011 and resulted in 8,570 observations of five bat species. The little brown bat was the most common (80%) followed by Indiana bats (10%), big brown bats (9%), and to a much lesser extent, tri-colored bats (<1%). Two gray bats were observed under the bridge. The bridge showed a preponderance of male (rather than female) Indiana bats, especially in the summer and fall. The northern concrete foundation of the bridge had more bats than the southern concrete foundation.

The bridge serves as a mating site, day/night roost and migratory stop-over for little brown bats and the federally endangered Indiana bat. It also serves as a maternity roost for the little brown bat. In lower numbers, big brown bats used the bridge throughout the year to roost and possibly mate and for a nursery. Tri-colored bats occasionally roosted under the bridge from November to May, two of which died under the bridge during winter.

During mist netting surveys at the bridge site, 84 bats were banded with orange-colored bands from 26 May to 3 August 2004 (Bryan et. al., 2004). During subsequent surveys until 2011, nineteen (23%) of these bats were recaptured with many more visual sightings of orange bands. Banding was also conducted on 12 days between 29 April and 16 October 2008 with 224 bats being fitted with silver metal bands. Banding included 60 Indiana bats, 154 little brown bats, 6 big brown bats, and 4 tri-colored bats. Banding studies determined many bats had a high fidelity to this bridge, and it was used by Indiana bats that hibernated in at least two different Priority 1A Indiana bat hibernacula. One of the banded Indiana bats was relocated within a hibernaculum 15 miles away, while another was found in a hibernaculum 60 miles away. During banding in 2008, 181 bats had their wing membranes scored for White Nose Syndrome (WNS). Results showed 179 bats with scores of "0", one female little brown with a score of "1" and one female Indiana bat had a score of "0-P".

On 8 July 2008, three temperature data loggers (iButtons®, Maxim Integrated Inc., San Jose, CA) were placed under the north end of the bridge; one placed on a tree near the north end; and two were placed under the south end of the bridge. Field observations revealed that *Myotis* species

avoided roosting near these data loggers, but *Eptesicus* did not avoid them. On 22 November 2008, we determined that the iButtons emitted ultrasonic noise at approximately 30 kHz. Because of this discovery, the data loggers were removed from the bridge in March 2009 before *Myotis* species returned and a paper was subsequently published with these findings (Willis et al., 2009).

A temperature comparison using data from iButtons showed the south concrete foundation significantly warmer than the north concrete foundation from July to October ($p < 0.0001$ for July to September; $p < 0.0062$ for October), while there was no difference in November to March. The bridge acts as a thermal sink at night and throughout most of the day with possibly the exception in the afternoon. This condition was especially notable during warmer months like August. The bridge has warmer temperatures, more consistent temperatures and fluctuates less than outside temperatures from July to February. March did not show such a trend. April to June were not tested since data loggers were removed in mid-March after they were found to make ultrasonic noise affecting bat roosting.

Introduction

Previous studies by the Federal Highway Administration (FHWA), Departments of Transportation (DOTs) and Bat Conservation International have found bats making extensive use of bridges and culverts for both day and night roosts (Keeley and Tuttle, 1999; Sandel et al., 2001; Whitby, 2000). In Indiana, most available data indicate bridges being used as roosts (Duchamp et al., 2004; Whitaker et al., 2004) although one study emphasized bridge use by bats as a thermal sink for night roosting during feeding bouts by the Indiana bat (Kiser et al., 2002).

Efforts to use bridges and culverts as bat management tools remain rare (Arnett and Hayes, 2000; James and Palmer, 2007). However, with ongoing bat population declines and habitat destruction, more managers are recognizing and appreciating their use as important alternative roosting habitat (Keeley and Tuttle, 1999). Bridges can provide day, night, maternity and migratory roost sites (Adam and Hayes, 2000; Lance et al., 2001), while also providing temperature stability, predator protection and proximity to foraging areas. Thus, with the loss of natural roosts and the ready availability of bridges and culverts, it is not surprising that 24 of 45 bat species in the United States roost in these anthropogenic sites (Keeley and Tuttle, 1999). In the U.S., there are six federally endangered bat species, two of which roost (*M. sodalis* and *M. grisescens*) in bridges (Keeley and Tuttle, 1999).

In the United States, roughly 3,600 highway structures (about 1%) are used by an estimated 33 million bats (Keeley and Tuttle, 1999). Features of bridges that correlate with bat use are well known (Adam and Hayes, 2000; Davis and Cockrum, 1963; Erickson, 2002). According to a California Department of Transportation (CALTRANS) study, major bridge features include: (1) built before 1950; (2) located in a rural area; (3) constructed over a water way; and (4) possess girder construction including concrete, timber and steel materials (James and Palmer, 2007). Keeley and Tuttle (1999) found day roosts with expansion joints and crevices protected bats from predators and inclement weather.

These bridges are typically found in warm areas, constructed of concrete, contain crevices, have roost heights at least 10 feet above ground, are rain-watered sealed, exhibit full sun exposure and are not situated over busy roadways (Keeley and Tuttle, 1999). Their study found night roosts in open areas between support beams where bats gathered to digest food. Such an environment buffers weather changes and has a large thermal mass that remains warm at night. Vertical concrete surfaces between beams provide protection and are used when heated by full sun exposure.

This paper provides data and observations made at a bridge located in Indiana between October 2006 and April 2011. The purpose was to discover what species use this bridge seasonally and learn features of the bridge suitable for roosting and migratory bats.

Description of Study Area

The metal bridge spans a large river. The exact location is being withheld at the request of the U.S. Fish and Wildlife Service (USFWS) to prevent potential disturbance to the bats by unauthorized visitors. It is located on a two-lane road through a rural setting. It was built in 1940 with 10 spans and is 984 feet long. The north and south reinforced concrete girder spans have full depth concrete sidewalls (similar to wing walls) that are open inside and placed into a hillside which creates the appearance of a cave. The underside of the bridge has cracks and crevices. The bearing of the bridge is 20º northeast with prevailing winds from the southwest (Figures 1 and 2).

The bridge has a 20 to 65 foot clearance over the river and bank. There is a cleared area about 20 feet wide on both sides of the bridge. Beyond that, the riparian area includes *Fraxinus pennsylvanica* (green ash), *Populus deltoides* (cottonwood), *Acer saccharinum* (silver maple) and *Platanus occidentalis* (sycamore). The ground below the north and south ends (concrete) have no

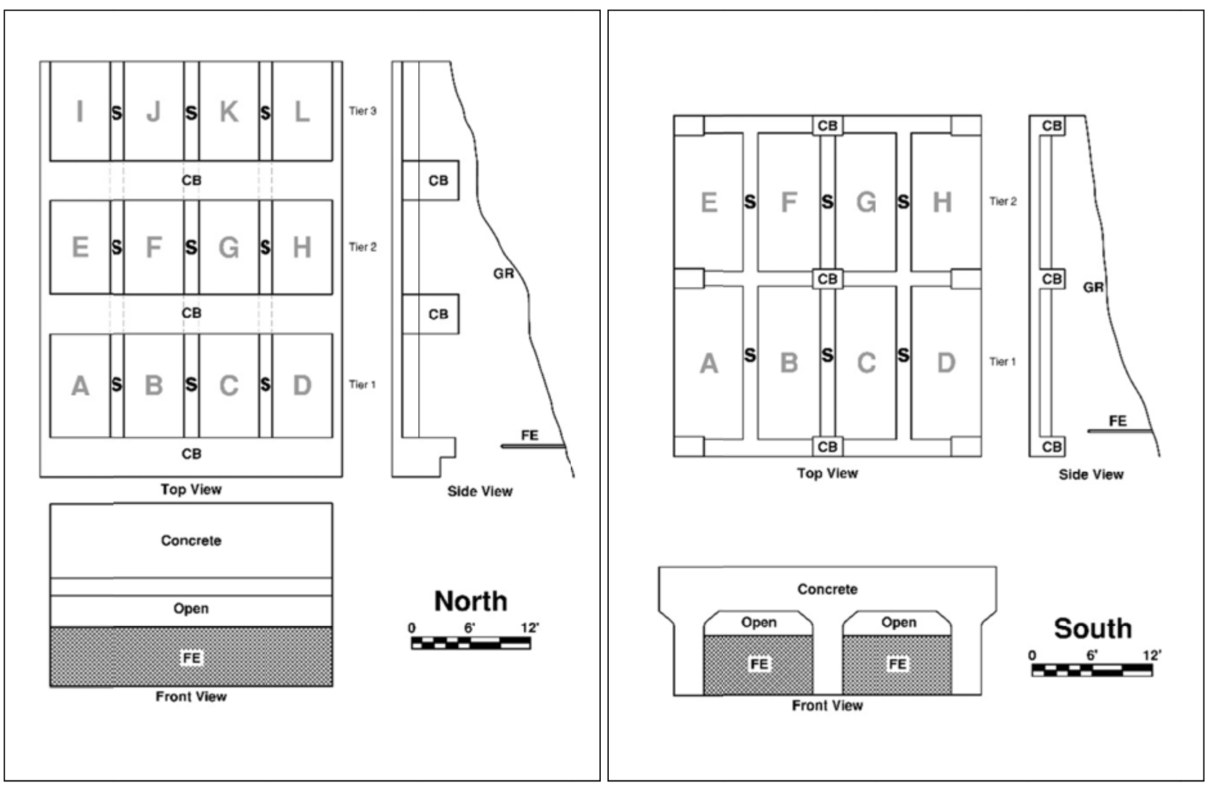

Figure 1. Front, top and side views of the bridge (S – stringers, CB – cross beams, FE – fence and GR - ground

Figure 2. North side of bridge.

Figure 3. Bats roosting along a seam.

vegetation and are sloped uphill from their opening to the back. For this paper, data from both the north and south ends were compiled to represent the bridge as a whole.

Methodology

Presence of bats (especially the Indiana bat) near concentrations of graffiti prompted INDOT, FHWA and the USFWS to install a 6-foot chain-linked fence with locked gates in April 2006 at both ends of the bridge. In September 2007, signage was erected that stated coordination with INDOT and USFWS was required prior to work on or within 200 feet of the bridge.

Bat biologists were contracted by INDOT and FHWA to study the bats under the bridge. Preliminary reviews occurred from April to September 2006. In October 2006, more formal surveys began and were conducted through April 2011. Sampling usually occurred between 1100 and 1300 hours. Data collected included the number of bats by species, locations and behaviors. The underside of each end of the bridge was divided into sections and tiers using stringers and cross beams (Figure 1).

Generally, sampling was conducted weekly in fall (September through November) when bats tend to leave for their hibernacula (Bryan et al., 2004) and in spring (March through May) when bats emerge from hibernation and move to their summer habitat. Field surveys in summer (June through August) and winter (December through February) were monthly.

Air temperatures, substrate temperatures and relative humidity were measured with an Extech IR thermometer and humidity reader under each end of the bridge. Lighting under the bridge was measured using an Extech light meter in each tier. Noise was measured using a Larson Davis DSP 82 SLM and a Larson Davis CAL 200 acoustic calibrator both on the underside and top of the bridge. Wind speed was measured using a Kestrel 1000 Pocket Weather Meter. In 2007, a 24-hour survey was completed from 1200 hours on 28 September until 1200 hours on 29 September.

Roosting bats and their associated stains occurred primarily along a seam on the stringers below the fillet (a weld of triangular or fillet shaped cross-section between two pieces at right angles) of the concrete ceiling or deck (Figure 3). Calipers were used to measure seam widths in areas associated with bat staining and in areas not stained. Seams were not present on outside walls (wing walls); however, there were some irregularities in the concrete along the wing walls and some deterioration in the deck ceiling. In two locations, the ceiling was cracked and hanging which provided space for bats to roost.

Ladders were erected under the bridge for closer observation of bats. Caution was taken at all times to minimize disturbance to the bats.

Results and Discussion

In Indiana, there are over 18,000 state and county-owned bridges (B. Dittrich, INDOT, pers. comm.) with INDOT responsible for 5,617 of these (INDOT, 2007). During the course of an INDOT highway study in 2004 and 2005, over 200 bridges and culverts were surveyed for bats. Only one bridge had roosting bats. This bridge is located in southwestern Indiana and was found to have Indiana bats, little brown bats, and big brown bats with two red bats mist netted near the bridge (Bryan et al., 2004; Kudlu and Brack, 2005). Later studies in 2006 to 2011 showed a limited number of tri-colored bats under the bridge. One gray bat was observed in April 2007 and one observed in September 2012. The Indiana bat and gray bat are listed as federally endangered species. No bats showed signs for WNS as first reported in Indiana on 1 February 2011 (Associated Press).

Physical Environment

Seams

A seam under the bridge is defined as a groove in the concrete along a stringer or cross-beam with the fillet/ceiling. Average seam width within bat stained areas was 2.9 millimeters (n = 50), while average seam width outside stained areas was 2.0 millimeters (n = 50). Selection of sampled sites was random. Outside walls (wing walls) did not have seams but did show some irregular surface areas. A seam is important for bats to get a foothold to roost. Few bats were observed roosting along the outer wall where seams were absent.

Staining

Stains on the concrete were visible year round and tended to be centrally located along stringers. Staining was not observed within two feet from cross beams and no bats were seen roosting along stringers closer than four to five feet from the ground even though bats had adequate open seams for roosting. Avoiding predators is likely an explanation in both cases.

On one occasion, a domestic cat (*Felis catus*) was observed under the bridge and a black rat snake was observed on the upper end of the fence. Raccoon (*Procycon lotor*) tracks were routinely noted under the bridge. Keeley and Tuttle (1999) found bats prefer the highest roost heights. In addition, some bats were seen roosting in between loose concrete that had separated from the deck of the bridge.

Noise and Vibrations

On 3 May 2007, traffic counts from 1100 until 1200 hours and from 1330 until 1430 hours yielded 216 and 252 vehicles, respectively (70% to 80% cars). Noise levels above the bridge were 81.4 to 84.6 decibels, while under the bridge were 84.1 to 85.0 decibels.

Generally, bats did not appear affected by traffic noise or vibrations conducted through the concrete. However, more intense vibrations caused bats to take to the air, but to ultimately return to roosting. Results are similar to Keeley and Tuttle's (1999) findings where bats appeared to be habituated to vibrations and sounds associated with normal traffic.

Lighting and Wind
On 26 October 2007, light measurements under the bridge were 162 or less lux, while above the bridge they were 9,688 or greater lux. Under the bridge and moving to the back, each tier measured less light. On the north side, bats preferred darker roosting areas: 1,327 bats (45%) roosted in the back, 1,026 (34%) roosted in the middle and 631 (21%) roosted in the front.

When disturbed, bats would fly to higher heights near the front. On 5 December 2007, wind exterior to the underside of the bridge averaged 2.7 miles per hour (mph) with wind speeds under the bridge in all tiers measuring 0 mph. Thus, the bridge not only has varying degrees of darkness, it also is windless and protects bats from rain, sleet, hail and snow.

Air Temperature
Air temperatures at the time of surveys were between 41°F to 89°F in spring and between 41°F to 84°F in fall. In summer, air temperatures were between 77°F to 91°F and between 30°F to 70°F in winter.

A temperature comparison showed the south concrete foundation significantly warmer than the north concrete foundation in July to October ($p < 0.0001$ for July to September; $p < 0.0062$ for October), while there was no difference in November to March. This may be due to the smaller aerial volume in the south than the north concrete foundation.

In addition, the bridge acts as a thermal sink at night and throughout most of the day with possibly an exception in the afternoon. This physical attribute is especially notable during warmer months. The substrate of the bridge has warmer temperatures, more consistent temperatures and fluctuates less than outside temperatures from July to February. March did not show such a trend. April to June were not tested since data loggers were removed in mid-March after they were found to make ultra-sonic noise affecting bat roosting.

Relative Humidity
Average relative humidity was 48% to 83% in spring and 39% to 80% in fall. During summer, relative humidity was 43% to 76%; in winter relative humidity was 50% to 79%. No differences were evident between the seasons.

Biological Environment
Formal surveys began 13 October 2006 and continued to 3 April 2011. There were 118 visits to the bridge which observed 8,570 bats comprising five species (Table 1). The little brown bat was the most common (80%) followed by the Indiana bat (10%), big brown bat (9%) and to a much lesser degree, the tri-colored bat (<1%) and 2 gray bats (one observed in September 2012 by Jared Helms, pers. comm.).

The bridge had a ratio of 70 males to 21 females Indiana bats (Table 2). There were greater than three times more male Indiana bats than females. Mating was observed for little brown bats and Indiana bats during fall. Ratio of males to females in Indiana bats in the spring is 13 males to 12 females, while in late summer to fall (during mating time) is 57 males to 9 females. It is thought that in the fall, females do not stay long at the bridge, but males await their arrival and stay until females leave the bridge completely. The bridge is located within 15 miles of a large Indiana bat hibernaculum.

Little brown bat females give birth to their pups and raise their young under the bridge thus accounting for numbers of 48, 63 and 60 females in summer. Mating follows with males available from June through October with numbers of 64, 91, 102, 56 and 22. The ratio of male little brown bats to female little brown bats in September was 56:4. In October it was 22:0. A similar trend was observed for Indiana bats from July to October (Table 2).

Table 1. Monthly data on visits and bat species observed under bridge.

Month	# of Visits	Indiana	Big Brown	Little Brown	Tri-Colored	Gray	Total
January	5	0	33	0	1	0	34
February	5	0	9	0	5	0	14
March	5	3	10	13	1	0	27
April	19	31	16	82	5	1	135
May	9	64	18	440	6	0	528
June	10	8	33	1274	0	0	1315
July	8	55	69	1464	0	0	1557
August	9	39	212	1844	0	0	2050
September	7	85	105	1214	0	1	1405
October	16	449	152	472	0	0	762
November	16	136	50	81	7	0	155
December	7	1	67	3	4	0	62
Totals	118	878	774	6,887	29	2	8,570
% of Total		10.3%	9.0%	80.3%	0.3%	<0.1%	

Table 2. Monthly data showing gender and bat species

Month	Indiana Bats		Big Brown Bats		Little Brown Bats		Tri-colored Bats	
	Females	Males	Females	Males	Females	Males	Females	Males
January				1				
February				1			1	1
March			1	1	3			
April		1			8	7	2	
May	12	12		2	21	24	1	1
June			2	3	48	64		
July	5	21	3	7	63	91		
August	2	10	17	8	60	102		
September	2	21	2	1	4	56		
October		5	2	7		22		
November			2	4		1		
December				1				
Totals	21	70	29	36	207	367	4	2

Indiana Bats

Preliminary observations in 2006 (April to October) showed Indiana bats using the bridge. They started arriving in August and their numbers increased in September. The number for each species was first recorded on 13 October 2006. There were 76, 68, 28, 1, 35, 14, 10 and 8 on October 13, 20, 27, 30 and November 3, 8, 16 and 21 respectively. No Indiana bats were observed during surveys on November 30 or December 21 in 2006. Most of the Indiana bats left after 3 November except for a cluster that remained until mid-late November. Subsequent to the October and November visits, it became apparent this bridge was more than a summer roost for bats; it appears the bridge also serves as a “stop over” for bats during migration. In the fall of 2006, 240 Indiana bats were recorded under the bridge during 10 visits.

In 2007, surveys were conducted on 19 January and 21 February with three Indiana bats first observed under the bridge on 28 March. Spring numbers were low and highly variable (April 4, 11, 18, 24 and May 3 – Indiana bats were 12, 0, 0, 5 and 0 respectively), and peaked 8 May with 18 Indiana bats and 30 May with 17 Indiana bats. Four Indiana bats were observed on 13 June 2007. No Indiana bats were observed on 13 July or 13 August 2007 during their maternity season. On 23 August, four Indiana bats were observed at the bridge, presumably the first fall migrants. No Indiana bats were seen on 24 August and 30 August, and one Indiana bat was observed on 7 September. Mating was observed on 29 September 2007. A 24-hour survey from September 28 (noon) to September 29 (noon) observed a maximum number of 40 Indiana bats at 4 p.m. and 6 p.m. Indiana bats peaked from 14 September to 19 October (September 14 and 21 and October 5, 12, and 19 with 29, 23, 18, 32 and 36 respectively). Ten Indiana bats were observed on 26 October 2007. During fall 2007, most Indiana bats left the bridge after 26 October with one Indiana bat observed on 31 October. No Indiana bats were observed on 8 November. One Indiana bat was observed on 16 November, 20 November and 5 December. When temperatures warmed the second week of December, this bat was not observed on 12 December or 19 December 2007. In 2007, 212 Indiana bats were recorded under the bridge during 28 visits. In October 2007, 97 Indiana bats were recorded during five visits.

In 2008, during 40 visits to the bridge, a total of 153 Indiana bats were observed which is lower than preceding years. Those Indiana bats that could be identified to gender showed a male to female ratio of 10:12 ratio in April and May, and a disproportionate 44:7 ratio in summer and fall. Indiana bats were recorded for the first time in July and August and fewer Indiana bats in September and October than preceding years.

During 2008, 224 bats were banded under the bridge from 29 April to 16 October. Banding Indiana bat records from 2008 to 2011 (Table 3) showed nine silver band recaptures (8 males and 1 female) and sightings of 60 silver bands (43 males and 17 females). All Indiana bats were recaptured in 2008 except one female (#550) which was recaptured two years later on 14 May 2010. One orange banded male Indiana bat (#1102 banded on 28 May 2004) was recaptured on 20 October 2006.

Visits to the bridge in 2009, 2010 and 2011 concentrated on early arrival and summer with little to no effort in the fall. In 2009, there were 11 Indiana bats recorded during 13 visits, and in 2010, there were 10 Indiana bats recorded during 11 visits. In 2011, there were no Indiana bats during two visits in early spring.

This bridge is within 15 miles of one of the largest Indiana bat hibernacula in its range (n = 49,617 in Jan 2013); within 25 miles of 12 other Indiana bat hibernacula; and about two miles upstream of a known Indiana bat maternity colony. Indiana bats did not use this bridge as a hibernaculum nor have they used other bridges as hibernacula (USFWS, 2007). In contrast, Indiana bats frequently are found hibernating in a variety of other man-made structures such as abandoned mines, tunnels and a dam (USFWS, 2007). In the State of Indiana, only natural caves are currently known to serve as hibernacula (Whitaker et al., 2007).

Little Brown Bats

Little brown bats are the most common bat roosting under this bridge. In 2006, most little brown bats left the bridge after 3 November (October 13, 20, 27, 30 and November 3 showed 22, 44, 44, 7 and 27 respectively). Numbers on 8 November and 16 November showed 6 little brown bats, 1 little brown on 21 November and no little brown bats on 30 November and 21 December. In 2007, the earliest arrival of little brown bats was presumably 28 March (n=10). Numbers remained low at 24, 8, 0, 13 for April 4, 11, 18 and 24 respectively. Numbers increased to 60, 27 and 173 on May 3, 8, and 30 respectively.

Two sparsely haired, non-volant pups were observed on 8 June 2007 along with approximately 163 adults. On 13 June 2007, five pups and 132 adults (including nine pregnant females) were seen. On 13 July, the number of little brown bats increased to 250 and no pups were observed; it is assumed they were volant by this time. Little brown bats normally have one pup per year (Whitaker et al., 2007) so the large increase could be due to recruitment. Mating was observed in many little brown bats on 23 August and 28 September. Numbers were high at 349, 364, 359, 225, 182, and 108 on 24 August, 30 August, 7 September, 14 September, 21 September, and 5 October respectively. A 24-hour study showed a maximum number of 183 little brown bats at 4 p.m. on 28 September. On 12 October, there were 34. Most little brown bats left the bridge after 19 October (n=4) with only one little brown bat recorded thereafter (26 October, 8 November, 12 December and 19 December), and none were seen on 31 October, 16 November, 20 November or 5 December.

Data for little brown bats showed consistently from 2008 to 2010 that the bridge is used as a maternity and nursery for their young. Referring to 2008 data, little brown bats arrived in April and stayed until October with one bat in November and December. Data for little brown bats in 2008 were 24, 30, 511, 894, 780, 240 and 91 for April, May, June, July, August, September and October respectively. A similar trend was observed for 2009 and 2010 with no observations during summer in 2011.

Banding for little brown bats showed 14 orange band recaptures, 49 silver band recaptures and visual sightings of 90 males and 64 females. These numbers are expected since the males and females are together in the maternity and nursery from June to September allowing for greater opportunities to be recaptured or bands seen from the ground. One male (#535) was recaptured three times. He was banded on 28 June 2008 and recaptured on 8 July 2008 and 18 August 2008 and again two years later on 6 August 2010.

Big Brown Bats

The big brown bat was consistently found under the bridge, but their numbers were usually five or fewer (55% of the time) or 10 or fewer (78% of the time). On 13 July 2007, there were 35 big brown bats, while on 24 August there were 73. Whether this increase is related to recruitment by young is unknown, but highly probable.

From 30 November 2006 until 19 January 2007, big brown bats were the only bat species observed under the bridge. No species of bats were found on 21 February 2007. The presence of big brown bats at this time of year is consistent with observations that they often hibernate in buildings and are prone to be active during winter warm spells (Whitaker et al., 2007). The same pattern was observed in late 2007.

From 2008 to 2011, big brown bats were common, but in low numbers even in winter months. Their numbers increased from June to October which is similar to the little brown bat suggesting the bridge is used as a maternity and nursery. On one occasion (12 July 2008), a lactating big brown bat that was banded in 2004 (#1965), had two pups on each side. Her teats were exposed and no hair was found around the upper two teats and the lower left teat. She was recaptured on 31 October 2007 and 16 October 2010. She was initially banded on 3 August 2004 yielding a six year interval between bandings. Another female big brown bat (#1957) was banded on 3 August 2004 and recaptured approximately five years later on 17 June 2009. A male big brown bat (#202) was banded with a silver band on 31 July 2008 and recaptured again that year (13 August 2008) and again the next year on 28 May 2009.

Tri-Colored Bats
From 21 November 2006 until 21 December 2006, three eastern pipistrelles were observed under the bridge. In 2007, a tri-colored bat roosted in the same spot from January through April; it was discovered dead at that spot on 11 April 2007. Three other individuals were seen on 3 and 8 May 2007. Ferrara and Leberg (2005) found an increased presence of this species during winter in Louisiana.

More recent information seems to suggest they are using the bridge as a "stop over" in migration. Efforts in 2008-2011 observed three tri-colored bats in April 2008; three in May 2008; two in November 2008; two in December 2008; and two in February of 2011. Their frequency is low and occurrence under the bridge is in winter to early spring.

Four tri-colored bats were banded with silver bands in 2008 (BRR AO503, BRR AO513, BRR AO524, and BRR AO533). They were three females (two banded on 29 April 2008 and one banded on 29 May 2008) and one male (banded on 8 May 2008). The female banded on 29 May 2008 was pregnant. There were no recaptures for tri-colored bats during this study.

Red Bats
Two red bats were mist netted and banded on 3 August 2004 next to the bridge. During surveys in 2006 and 2007 and from 2008 to 2011, no red bats were observed using the bridge. The red bat is a solitary species that roosts in foliage (Whitaker et al., 2007).

Gray Bat
A gray bat was observed under the bridge on 13 April 2007. The distribution for the gray bat in Indiana is primarily in south central counties bordering the Ohio River. This bat is considered an outlier to the main summer population of gray bats in Indiana. In September 2012, Jared Helms reported a gray bat under this bridge (pers. comm., 2012).

Roosting Behaviors
It appears Indiana bats tend to roost singly or in groups of up to 20 individuals. They roosted with little brown bats on occasion and with a big brown bat on a couple of occasions. Little brown bats also roosted singly or in small groups up to 30 individuals or occasionally up to 70 bats. Big brown bats usually roosted singly or in pairs and occasionally with little brown bats.

Banded Bats
Eco-Tech banded 84 bats (51 little brown bats, 24 big brown bats, 8 Indiana bats and 1 red bat) with orange-colored bands during mist net surveys under this bridge on 26 May and 3 August 2004 (Bryan et. al., 2004). Males were banded on the right forearm and females on the left. Results with orange bands showed on 20 October 2006, one male Indiana bat (#1102); on 30

October 2006, one non-reproductive female little brown bat (#1453); on 13 June 2007, one pregnant little brown bat (#1110); on 24 August 2007, one non-reproductive female little brown (#1114); on 29 August 2007, two banded little brown bats (#1107 - male and #1954 – female); on 30 August 2007, two banded little brown bats (#1107 – male and #1450 – female); on 7 September 2007, two little brown bats (#1450 – female and #668 –male); on 14 September 2007, one male little brown (#1453); on 5 October 2007, two male little brown bats (#1119, #1449); and on 31 October 2007, one female big brown (#1965). In 2008, little brown bats #1453 and #1954 and big brown bat #1965 were recaptured twice. A male big brown bat (#1957) was recaptured on 6 June 2009 (approximately five years from banding in 2004).

During the 24-hour study on 28-29 September 2008, an orange band was seen on one little brown bat, while an orange band was seen on one male big brown bat on 26 October 2008. These re-captures and visual sightings show bats in 2004 were still using this bridge in 2006, 2007 and 2008. Results from 2008-2011 on orange bands yielded two of 24 (8%) big brown bats; nine of 51 (18%) little brown bats; and one of eight (13%) Indiana bats. In addition, two big brown bats and 17 little brown bats were visually observed with orange bands.

A Study Plan for banding bats under the bridge was approved by USFWS on 11 April 2008 under the Federal Permit #TE-179711-0.

Twelve formal banding visits were conducted by bat biologists between 29 April and 16 October 2008. During these visits, 224 bats were banded with silver metal bands, which included 60 Indiana bats (43 males or 72%), 154 little brown bats (90 males or 58%), six big brown bats (4 males or 67%), and four tri-colored bats (1 male). Results from 2008-2011 showed one recaptured big brown bat (male), 28 recaptured little brown bats (23 males) and nine recaptured Indiana bats (8 males). Males comprised 84% of the recaptures. In addition, 12 big brown bats (10 males), 178 little brown bats (117 males), and nine Indiana bats (8 males) were visually seen to have silver bands. Males comprised 68% of the bats seen with silver bands. Table 3 shows results for orange and silver bands.

Table 3. Banding data for orange (2004) and silver (2008) bands.

Band Color	Species	Band Number	Gender	Original Date	Recapture Date	Recapture Date	Recapture Date	Recapture Date	Recapture Date
Orange	IB	1102	Male	5/26/04	10/20/06				
	BB	1957	Female	8/3/04	6/17/09				
	BB	1965	Female	8/3/04	10/31/07	7/12/08	10/16/08		
	LB	668	Male	5/26/04	9/7/07				
	LB	1107	Male	5/26/04	8/29/07	8/30/07			
	LB	1110	Female	5/26/04	6/13/07				
	LB	1114	Female	5/26/04	8/24/07				
	LB	1119	Male	8/3/04	10/5/08				
	LB	1449	Male	5/26/04	10/5/07				
	LB	1450	Female	8/3/04	8/30/07	9/7/07			
	LB	1453	Female	5/26/04	10/30/06	9/14/07	9/25/08		
	LB	1954	Female	8/3/04	8/29/07	6/28/08			
Silver	IB	48	Male	9/25/08	10/5/08				
	IB	501	Male	5/8/08	9/10/08				
	IB	506	Male	5/8/08	8/18/08				

	IB	507	Male	5/8/08	7/8/08				
	IB	513	Male	5/8/08	7/17/08				
	IB	523	Male	7/17/08	9/10/08				
	IB	525	Male	7/17/08	9/25/08				
	IB	528	Male	7/31/08	10/16/08				
	IB	550	Female	7/17/08	5/14/10				
	BB	202	Male	7/31/08	8/13/08	5/28/09			
	LB	501	Male	4/29/08	5/21/08				
	LB	502	Male	4/29/08	5/21/08				
	LB	505	Male	4/29/08	6/5/08				
	LB	506	Male	4/29/08	6/28/08				
	LB	508	Female	4/29/08	6/5/08				
	LB	510	Female	4/29/08	6/5/08				
	LB	518	Female	5/8/08	7/6/08	6/19/10			
	LB	527	Male	5/15/08	10/5/08	8/6/10			
	LB	531	Male	5/29/08	7/8/08				
	LB	534	Male	5/29/08	6/5/08	9/29/10			
	LB	535	Male	5/29/08	6/28/08	7/8/08	8/18/08	8/6/10	
	LB	539	Male	7/17/08	8/7/08	8/18/08			
	LB	541	Male	7/17/08	7/31/08				
	LB	551	Male	9/25/08	10/5/08				
	LB	589	Male	9/25/08	6/28/09				
	LB	597	Male	9/25/08	9/25/08				
	LB	958	Male	7/31/08	6/17/09				
	LB	959	Female	7/31/08	8/6/10				
	LB	964	Male	7/31/08	8/13/08	8/18/08	9/25/08		
	LB	969	Male	8/7/08	9/27/09				
	LB	974	Male	8/7/08	9/25/08				
	LB	975	Male	8/7/08	8/18/08				
	LB	977	Male	8/7/08	9/27/09				
	LB	981	Male	8/27/08	10/16/08				
	LB	990	Male	8/27/08	6/17/09				
	LB	6153	Male	7/17/08	6/7/10				
	LB	6159	Male	7/17/08	9/10/08	7/31/08			
	LB	6199	Female	7/17/08	8/27/08				

24-Hour Study

During a 24-hour survey from 1200 hours on 28 September 2007 to 1200 hours on 29 September 2007, 1,699 bats were counted including 1,329 little brown bats (78%), 241 Indiana bats (14%) and 129 big brown bats (8%). Number of big brown bats stayed fairly constant (x=10, SD=3), while Indiana bats (x=19; SD=15) and little brown bats (x=102; SD=62) varied during the 24-hour period (Figures 4 and 5).

Average number of bats between noon and dusk was 217, night time (dark) was 48 and morning (post-dark) was 124. Fifty bats left from under the bridge between 1800 and 2000 hours with more of a decline from 2000 to 2200 hours (~150 bats). Between 2400 and 0600 hours, the number of bats under the bridge remained fairly constant (x=49; SD=13); by 0800 hours, many bats returned to the bridge (~115); and for 1000 and 1200 hours there were 130 and 126 respectively.

At the end of the study, there were about 90 fewer bats under the bridge. Observations included two separate matings by Indiana bats and a movement by bats to higher elevations which may be explained by bats preferring the highest, darkest locations (Keeley and Tuttle, 1999). Bats may have moved to higher elevations to be further away from investigators.

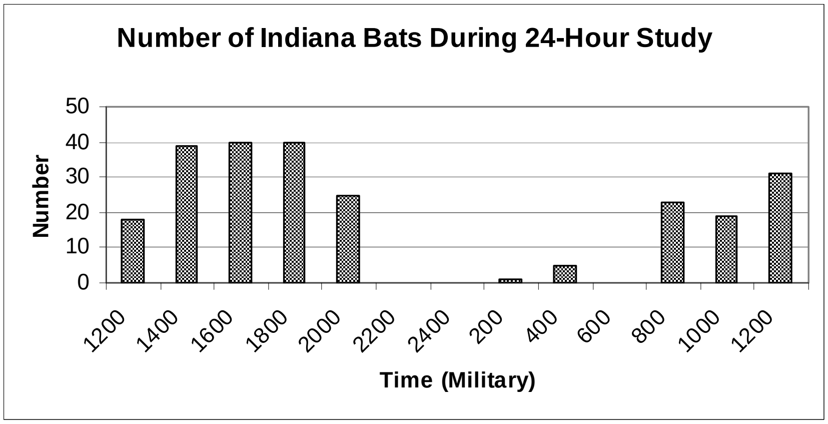

Figure 4. Number of Indiana bats observed in a 24-hour period on 28-29 September, 2007.

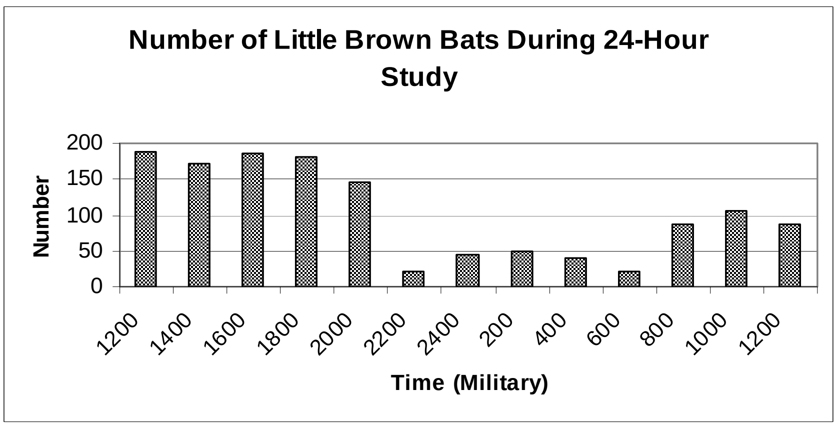

Figure 5. Number of little brown bats observed in a 24-hour period on 28-29 September, 2007.

Relative humidity during the 24-hour study ranged 31% to 83% with the lowest readings from 1200 to 1800 hours (31% to 50%) and highest readings from 0200 to 0800 hours from 54% to 83%.

Air temperatures ranged 53ºF to 86ºF. Warmest temperatures were from 1200 to 1600 hours at 78ºF to 86ºF respectively. Coolest temperatures were from 0400 to 0800 hours at 53ºF to 58ºF. From 2000 to 0800, substrate temperatures were warmer than air temperatures with the lowest temperatures at 2000 (32ºF) and highest at 0800 (46ºF).

Acknowledgements

We thank the INDOT and Federal Highway Administration (FHWA) for this study and for funding the installation of protective fencing and signage; the assistance of Wayne Dittelberger and April Arroyo-Monroe from the INDOT Vincennes District; and Nathan Saxe, Robert Buskirk and David Glista (INDOT Central Office in Indianapolis); and Tony DeSimone and Michelle Allen (FHWA in Indianapolis) for their review of this paper and involvement in the study.

We are also grateful to John Whitaker, Dale Sparks, and Brianne Walters from Indiana State University; Scott Pruitt and Lori Pruitt from the U.S. Fish and Wildlife Service (Bloomington Field Office); Virgil Brack, Adam Mann and Jason Duffey from Environmental Solutions and Innovations; Hal Bryan from Eco-Tech, Inc.; and Joe Dabkowski, Kia Gillette, Jason DuPont, Jeremy Kieffner, Cheryl Folz, Matt Riehle, Tommy Cervone, Michael Cervone, Seth Hauschild and Brooke Vorbeck from Bernardin, Lochmueller and Associates for their assistance. We also thank Randy Weaver for creating bridge diagrams and for designing an extension for measuring upper light intensity readings.

This paper is dedicated to Hal Bryan from Eco- Tech who was instrumental in studying this bridge and died on February 15, 2010. His memory and efforts in studying bats will be remembered. Thank you Hal.

Literature Cited

Adam, M. D. and J.P. Hayes. 2000. Use of Bridges as Night Roosts by Bats in the Oregon Coast Range. Journal of Mammalogy, 81(2): 402-407.

Arnett, E. B., and J. P. Hayes. 2000. Bat use of roosting boxes installed under flat-bottom bridges in western Oregon. Wildlife Society Bulletin 28:890–894.

Bryan, H. D., R.D.M. Smith, J. E. Spencer and P. L. Droppelman. 2004. Summer Habitat for the Indiana Bat (*Myotis sodalis*) within the Wabash Lowland Region from Washington to Scotland, Indiana. 2004. Eco-Tech, Inc., Frankfurt, Kentucky.

Davis R. and E.L. Cockrum. 1963. Bridges Used as Day Roosts by bats. Journal of Mammalogy, 44: 428-430.

Duchamp, J. E., D. W. Sparks, and J. O. Whitaker, Jr. 2004. Foraging-habitat selection by bats at an urban-rural interface: comparison between a successful and a less successful species. Canadian Journal of Zoology, 82:1157-1164.

Erickson, G. A. 2002. Bats and bridges technical bulletin (Hitchhiker's guide to bat roosts). California Department of Transportation, Division of Env. Analysis, Sacramento, California.

Ferrara, F.J. and P.L. Leberg. 2005. Influences of investigator disturbance and temporal variation on surveys of bats roosting under bridges. Wildlife Society Bulletin 33(3): 1113-1122.

IN.gov. 2007. INDOT. Accessed 12/12/07. http://www.in.gov/indot/2768.htm

James, R.A. and B.K. Palmer. 2007. Baseline Surveys of Bridges and Modeling of Occupancy for Bats in California. Bat Research News, 2007.

Keeley, B.W. and M.D. Tuttle. 1999. Bats in American Bridges. Bat Conservation International.

Kiser, J.D., J.R. McGreggor, H.D. Bryan and H. Howard. 2002. Use of Concrete Bridges as Night roosts. Pp. 208-215 in the Indiana Bat Biology and Management of an Endangered Species (A. Kurta and J.

Kennedy, Eds.). Bat Conservation International, Austin, Texas.

Kudlu, P. and V. Brack, Jr. 2005. Additional Telemetry and Roost Studies of Summer Habitat for the Indiana bat (*Myotis sodalis*) within the Wabash Lowland, Crawford Upland and Mitchell Plain Regions from Elberfeld to Bloomington, Indiana. Unpublished technical report. Environmental Solutions and Innovations, Cincinnati, OH.

Lance, R.F., B.T. Hardcastle, A. Talley and P.L. Leberg. 2001. Day-roost Selection by Rafinesque's Big-eared Bats (*Corynorhinus rafinesquii*) in Louisiana Forests. Journal of Mammalogy, 82(1): 166-172.

Sandel, J.K., G.R. Benatar, K.M. Burke, C.W. Walker, T.E. Lacher, Jr. and R.L. Honeycutt. 2001. Use and selection of winter hibernacula by eastern pipistrelle in Texas. Journal of Mammalogy, 82(1): 173-178.

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

Weather Underground. Accessed 1/03/08. http://www.weatherunderground.com/cgibin/findweather/getForecast

Whitaker, J. O., Jr., D. W. Sparks, and V. Brack, Jr. 2004. Bats of the Indianapolis International Airport Area, 1991-2001. Proceedings of the Indiana Academy of Science 113:151-161

Whitaker, J.O., V. Brack, Jr., D.W. Sparks, J.B. Cope and S.Johnson. 2007. Bats of Indiana. Terre Haute, Indiana. Indiana State University, Center for North American Bat Research and Conservation.

Whitby, J.E., P.R. Heaton, E.M. Black, M. Wooldridge, L.M. McElhinney and P. Johnstone. 2000. First isolation of a rabies-related virus from a Daubenton's bat in the UK. The Veterinary Record 147(14): 385-388.

Willis, C. K. R., J. W. Jameson, P. A. Faure, J. G. Boyles, V. Brack and T. Cervone. 2009. Thermocron iButton and IBBat temperature dataloggers emit ultrasound. Journal of Comparative Physiology B Biochemical Systemic and Environmental Physiology. Volume 179 (7): 867-874

APPENDIX C

Thermochron iButton and iBBat temperature dataloggers emit ultrasound

J Comp Physiol B (2009) 179:867–874
DOI 10.1007/s00360-009-0366-0

ORIGINAL PAPER

Thermocron iButton and iBBat temperature dataloggers emit ultrasound

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Received: 9 March 2009 / Revised: 28 April 2009 / Accepted: 1 May 2009 / Published online: 26 May 2009

Abstract Thermocron iButton dataloggers are widely used to measure thermal microclimates experienced by wild animals. The iBBat is a smaller version of the datalogger, also commercially available, that is used to measure animal skin or core body temperatures when attached externally or surgically implanted. Field observations of bats roosting under a bridge suggested that bats avoided locations with iButtons. A heterodyne bat detector revealed that the dataloggers emitted ultrasound which was detectable from a distance of up to 30 cm. We therefore recorded and quantified the acoustic properties [carrier frequency (Hz) and root mean square sound pressure level (dB SPL)] of iButton and iBBat dataloggers. All units emitted a 32.9 kHz pure tone that was readily picked up with a time expansion bat detector at a distance of 1 cm, and most were detected at a distance of 15 cm. The maximum amplitude of iButton dataloggers was 46.5 dB SPL at 1.0 cm—a level within the range of auditory sensitivity for most small mammals. Wrapping iButtons in plastic insulation severely attenuated the amplitude of ultrasound. Although there was a statistically significant reduction in rates of warming and cooling with insulation, this effect was small and we suggest that insulation may be a viable solution to eliminate unwanted ultrasonic noise in instances when small delays in thermal response dynamics are not a concern. We recommend behavioural studies to assess if the electronic signals emitted by iButtons are disturbing to small mammals.

Keywords Bats · Chiroptera · Disturbance · Thermocron iButton · Mammals · Ultrasound

Introduction

Thermal microclimates exert strong influence on the lives of vertebrates, and the ability to quantify microclimate conditions experienced by wild animals is important for understanding their physiology, ecology, and behaviour (Boyles 2007; Hill et al. 2008; Withers 1992). The fact that many endothermic species are capable of pronounced heterothermy has also fuelled interest in measuring patterns of body (T_b) or skin temperature (T_{sk}) in free-ranging and captive individuals (Geiser 2004). The recent availability of miniature dataloggers has made collecting data on ambient temperature (T_a) and T_b much easier (Boyles 2007). For example, Thermocron iButton dataloggers (Maxim Integrated Products, Sunnyvale CA USA) have become a favorite with many biologists because they are small (~18 mm diameter by 6 mm thick), can store large numbers of time and date-stamped measurements (1,024–8,192 depending on the model), are easy to program and interface with, are rugged enough for field use (stainless steel

Communicated by I. D. Hume.

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casing), and, perhaps most importantly, they are relatively inexpensive.

Thermocron iButtons have proven useful for measuring thermal microclimates of nests, burrows, and roosts of a variety of species (e.g., Boyles et al. 2008; Mzilikazi and Lovegrove 2005; Warner and Shine 2007; Willis and Brigham 2005, 2007). They have also been used to monitor T_b or T_{sk} in heterothermic endotherms and ectotherms (e.g., Davidson et al. 2003; Fietz et al. 2003; Lovegrove 2009; Munro et al. 2005; Mzilikazi and Lovegrove 2004; Seebacher et al. 2003; Warnecke et al. 2007). Some studies have even used iButtons to monitor nest occupancy behaviour based on the assumption that warm endotherms elevate temperature inside the enclosed nest space (Freezer 2005; Willis et al. 2005). Recently, to reduce the size and mass of iButtons and allow for monitoring of T_b or T_{sk} in small animals, custom dataloggers have been built by removing the internal components (battery, thermistor, clock and data storage chip) from the stainless steel canister and encasing them in plastic or similar material. These size-reduced dataloggers can be glued to the skin or attached via a collar, or coated with a biologically inert wax for surgical implantation (Landry-Cuerrier et al. 2008; Lovegrove 2009; Robert and Thompson 2003). Similar units are commercially produced under the names iBBat or iBCollar (Alpha Mac Inc. Mont St-Hilaire, Quebec, Canada).

There is no doubt that iButton technology has facilitated important insights and provided new data on microclimates and body temperature variation that would have been extremely difficult, if not impossible, to obtain by other means. However, to our knowledge, there are no studies comparing the behaviour or physiology of animals outfitted or exposed to iButtons with that of control animals. Similarly, there are no behavioural studies of animals instrumented with different kinds of electronic devices used to record field temperature data (e.g., iButtons vs. temperature-sensitive radio transmitters).

Some electronic devices emit sounds in the frequency range audible to humans (i.e., between 20 and 20,000 Hz), whereas others may emit ultrasound (i.e., sound frequencies above human hearing) (Schiek et al. 2006). Thermocron iButtons do not emit audible acoustic signals, but it is unknown if they emit ultrasound. Among vertebrates, birds appear to have low sensitivity to ultrasonic frequencies (Pytte et al. 2004), but many terrestrial mammals are sensitive to ultrasound (e.g., Heffner et al. 2001). Indeed, many mammals use ultrasonic signals for acoustic communication (Kalcounis-Rüppell et al. 2006; Sewell 1970; Wilson and Hare 2004), and for orientation and navigation (Sales and Pye 1974). If Thermocron iButtons generate electronic ultrasound and are placed in mammalian nests or burrows, the devices could potentially influence habitat selection (e.g., by affecting nest or roost abandonment), interfere with activity cycles, or disrupt patterns of thermoregulation. In turn, this could directly influence the quality of our physiological and behavioural data. The potential for disturbance seems even more likely when the devices are attached to an animal to record T_{sk}. In addition to affecting behaviour of a focal animal wearing the device, emitted signals could interfere with acoustic communication or otherwise influence interactions with conspecifics.

Given their reliance on high frequency sounds for echolocation (Popper and Fay 1995), microchiropteran bats could be especially vulnerable to disturbance from electronically generated ultrasound. This is potentially of concern as researchers have used iButtons to measure roost microclimates (e.g., Neubaum et al. 2006; Solick and Barclay 2006, 2007; Willis and Brigham 2005, 2007) and to record T_{sk} of hibernating bats in the laboratory (Dunbar and Tomasi 2006). Currently, there is tremendous interest in the hibernation biology of bats because of the emergence of white-nose syndrome (WNS), a potential fungal pathogen devastating populations of bats hibernating in the northeastern United States (Blehert et al. 2009; Boyles and Willis 2009). WNS appears to disrupt energy balance during hibernation (Boyles and Willis 2009) so there has been considerable effort to quantify hibernacula microclimates and T_{sk} of hibernating bats, and much of this effort depends on iButton technology. If iButtons emit ultrasound, this could disturb bats in their hibernacula or in summer roost sites. Moreover, if the noise masks detection of echoes from objects in the environment when glued to a bat's back, then iButtons could interfere with echolocation and therefore, orientation and/or foraging during the active season (e.g., see Schaub et al. 2008).

Our interest in the potential of Thermocron iButtons to emit ultrasound was raised when we observed apparent behavioural changes of bats after placement of dataloggers in a roost. On 8 July 2008, five iButtons were placed under a bridge in central Indiana, USA to monitor microclimates of favored roosting sites selected by little brown bats (*Myotis lucifugus*), Indiana bats (*Myotis sodalis*), big brown bats (*Eptesicus fuscus*), and tri-colored bats (*Perimyotis subflavus*). The week following installation, no bats were observed roosting near the devices. During the next several weeks it became apparent that neither species of *Myotis* roosted near the iButtons, and big brown bats typically roosted no closer than 0.3–0.6 m. Based on these preliminary observations, we wondered if iButtons emit ultrasound that may be disturbing to bats. When we placed the microphone of a broadband heterodyne bat detector (Mini-2 Bat Detector, Ultra Sound Advice, London, UK) adjacent to an iButton, a signal between 30 and 40 kHz was detected to a distance of 30 cm. We monitored three models of Thermocron iButtons with the bat detector and ultrasound was detected from every unit. We also monitored four iBBat skin temperature dataloggers and detected ultrasound from those units as well.

Here we provide the first description of electronically generated ultrasound emitted by iButton and iBBat dataloggers. Our goal was to describe temporal and spectral features of iButton ultrasound and measure its amplitude to determine if the signal level was sufficiently loud to be detected by, and possibly disturb, bats and other small mammals. We tested a method of damping electronically generated ultrasound by wrapping iButtons in plastic foam insulation. We also tested whether the insulation interfered with the accuracy of thermal measurements collected by the dataloggers and their rates of heating and cooling.

Materials and methods

Sounds were recorded from three models of Thermocron iButtons (DS1921G, $n = 7$; DS1921L, $n = 1$; and DS1922L, $n = 7$) that were identical in external appearance (i.e., stainless steel canister) but that differed in functionality (Lovegrove 2009; Robert and Thompson 2003). The iButtons ranged in age from several months to several years, so our description of their sounds spans multiple lot numbers and is not specific to manufacturing date. We also recorded ultrasound from four iBBat dataloggers, which are essentially an iButton circuit board that has been removed from the casing, connected to a smaller battery, and coated in light plastic with two wire leads for data communication. Two of the iBBats had electronics from a DS1922L iButton, and two were built from DS1921G electronics.

Sounds were detected and/or recorded with the broadband microphone of a tunable heterodyne/time expansion bat detector (Model D240x; Pettersson Elektronik AB, Uppsala Sweden) set to a time-expansion factor of 10. Most recordings took place inside a 1.5 × 1.5 × 0.6 m anechoic chamber, constructed from 5 cm thick dimpled memory foam (i.e., mattress material), located in a quiet room in the Department of Biology at the University of Winnipeg. We mounted the bat detector in the centre of the chamber and connected it to a computer (outside the chamber) running SonoBat v2.6 (Arcata, CA). All other electronics, except one bank of fluorescent room lighting, were switched off during recording. The primary source of background noise was the building ventilation system. The bat detector was set to automatically record a 1.7 s sound sample when triggered by a finger snap. We also recorded background sounds with no datalogger inside the chamber (Fig. 1).

Ultrasound emissions were independently confirmed for five iButtons (three DS1921G, two DS1922L) and three iBBats at McMaster University using a U30 heterodyne bat detector (Ultra Sound Advice) inside a IAC Model 120A-02 double wall sound isolation booth (2 × 2 × 2 m; Industrial Acoustics Incorporation, Bronx NY). We also measured the root mean square amplitude of datalogger sounds, expressed in decibels sound pressure level (rms dB SPL re 20 μPa), using a Brüel & Kjær (B&K) Type 4135" condenser microphone (flat ± 3 dB 5–120 kHz; diaphragm 0° incidence, protective grid on) connected to a B&K Type 2610 Measuring Amplifier and calibrated with a B&K Type 4228 Pistonphone (124 dB SPL @ 250 Hz) and again with a B&K Type 4231 Acoustical Calibrator (94 dB SPL @ 1,000 Hz). To eliminate low frequency room noise, the microphone signal was band-pass filtered (Krohn-Hite Model 3500; −3 dB high-pass cutoff = 23 kHz and low-pass cutoff = 43 kHz) before the measuring amplifier.

The iButtons were recorded at a distance of 1, 15 and 30 cm; iBBats were recorded at 0.5 and 1 cm. We recorded the iBBats at shorter distances to estimate the SPL received at the ear of a bat with a datalogger attached to its back or of a small mammal outfitted with a collar. A 1 cm distance is also relevant to bats in hibernation because it approximates the distance from the head of one bat to a datalogger attached to an adjacent conspecific in a cluster. Prior to recording, iButtons and iBBats were programmed to log temperature records every 10 min, a typical sampling interval for field studies. However, based on our observations with bat detectors, dataloggers emit ultrasound regardless of whether or not they are programmed and recording temperatures.

Time-expansion sound files were analyzed with BatSound Pro (version 3.31a, Pettersson Elektronik AB) and SASLab Pro software (Avisoft Bioacoustics, Berlin, Germany). We selected a 400 ms window from the oscillogram [amplitude versus frequency (Hz)] and computed the magnitude spectrum [relative power (dB) versus frequency (Hz)] using a Fast Fourier Transform (FFT) analysis. We also computed the magnitude spectrum of background room noise with no datalogger present.

We tested an approach to dampen ultrasound emissions of iButtons, at least in situations where size and weight of the device are not of concern, by individually wrapping DS1921G iButtons ($n = 5$) in three layers of 4 mm plastic packaging of the type used to wrap electronic components and then monitoring wrapped and unwrapped iButtons with the D240x bat detector. We also determined whether the plastic wrapping adversely affected recording properties of the dataloggers when programmed to log temperature records every minute. Prior to wrapping for sound recordings, the five DS1921G iButtons were allowed to acclimate to room temperature (23°C) for at least 1 hour before we placed them in a custom-built temperature-controlled cabinet with T_a set to ~7°C. After 1 h at 7°C, the dataloggers were removed and allowed to re-warm to 23°C. The experiment was repeated with the same five iButtons after they were wrapped in plastic for ultrasound recordings.

Temperature-sensitive radio transmitters are also used to measure T_b or T_{sk} in free-ranging and captive animals, often

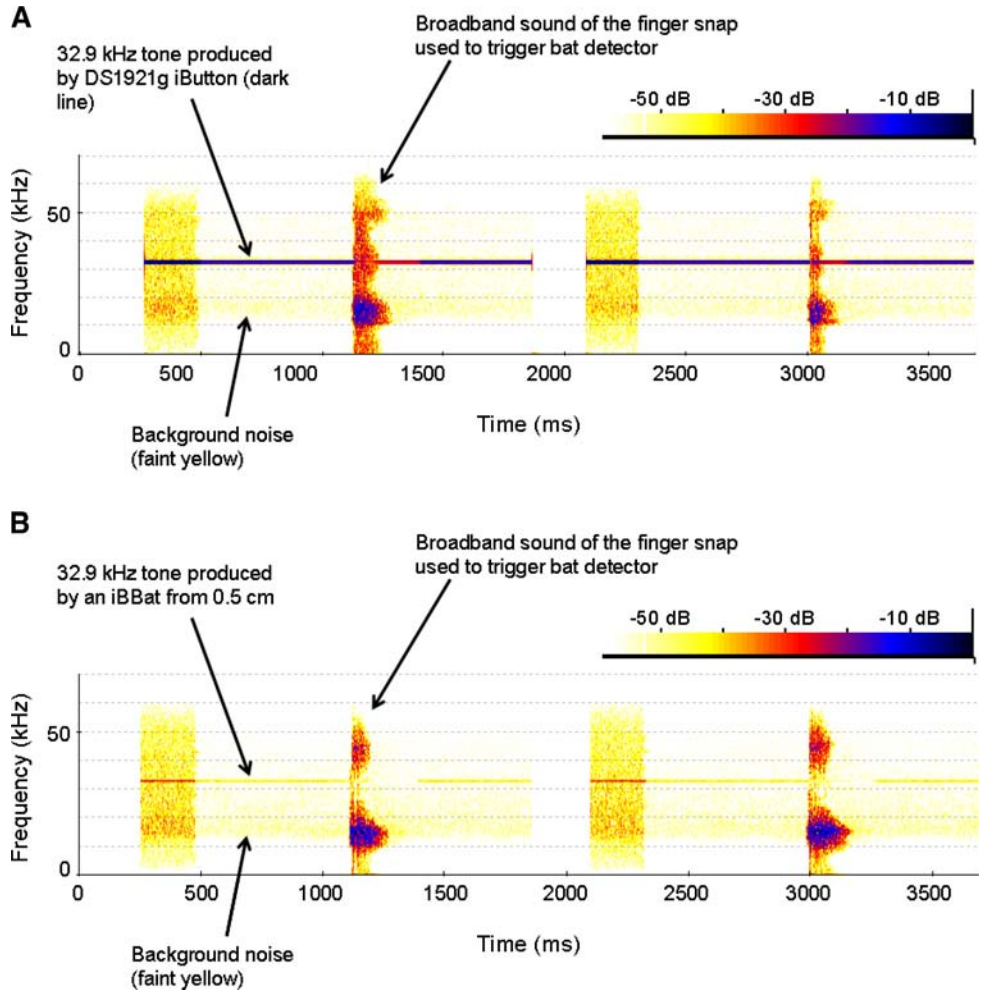

Fig. 1 Spectrograms of the 32.9 kHz tone produced by **a** a Thermocron DS1921G iButton recorded from a distance of 1 cm, and **b** an iBBat skin temperature datalogger recorded from 0.5 cm

alongside iButtons (e.g., Landry-Cuerrier et al. 2008; Lausen and Barclay 2006; Willis et al. 2006) so we conducted sound recordings of four activated BD-2T temperature-sensitive radio transmitters (Holohil Systems Ltd, Carp, ON, Canada) with the D240x bat detector. Transmitter electronics were coated in the layer of inert, waterproof epoxy applied by the manufacturer.

Data values are reported as the mean ± standard deviation (SD). Statistical analyses were performed with Systat v9 (SPSS Inc.). Analysis of variance (ANOVA) was used to compare peak signal levels above background at 32.9 kHz between iButtons and iBBats and group means were compared in post hoc analyses using Scheffe's tests. All statistical tests employed a comparison-wise error rate of $\alpha \leq 0.05$ (Zar 1984).

Results

In six of seven DS1922L iButtons, the one DS1921L iButton, and all seven DS1921G iButtons, ultrasound emissions were readily detected using the broadband microphone of a heterodyne/time expansion bat detector at a distance of 1 cm (Fig. 1a). The signal was a continuous sine wave tone at a frequency of 32.9 kHz. Five of the seven DS1922L iButtons emitted ultrasound that could be detected at 15 cm, while only one was detectable at 30 cm. Six of seven DS1921G iButtons emitted a 32.9 kHz continuous tone that could be detected at 15 cm, and five were detected at 30 cm. We also detected ultrasound emissions in the one DS1921L iButton at 15 and 30 cm. The four iBBats emitted 32.9 kHz ultrasound that could be detected at 0.5 and 1 cm (Fig. 1b).

Background noise levels in the IAC sound isolation booth were low, averaging 29.2 ± 0.4 dB SPL ($n = 8$) in the frequency band between 23 and 43 kHz. The low noise permitted us to directly measure the SPL of three of five iButtons (43.2 ± 4.2 dB SPL) and one of three iBBats (31.5 dB SPL) at a distance of 1 cm. The DS1921G iButtons were louder (46.5 and 44.5 dB SPL) than the DS1921L (38.5 dB SPL) iButton.

We measured the height (in dB) of the 32.9 kHz signal, relative to background, in the power spectra of iButton and iBBat recordings obtained with the D240x bat detector

(Fig. 2). For recordings at 1 cm, there was a significant difference in peak signal level above background between the DS1921G iButtons (29.0 ± 11 dB), DS1922L iButtons (11.7 ± 9.6 dB) and iBBats (8.6 ± 3.7 dB; ANOVA, $F_{2,14} = 7.5$, $P = 0.006$). Post hoc analyses revealed that DS1921G iButtons had a significantly louder peak signal level above background at 32.9 kHz than both DS1921L iButtons ($P = 0.016$) and iBBats ($P = 0.021$). The peak signal height above background was not significantly different between DS1921L iButtons and iBBats ($P = 0.89$) at 1 cm.

Not surprisingly, wrapping iButtons in plastic packing foam dramatically reduced the peak signal level recorded at 32.9 kHz from 30.1 ± 9.7 to 5.9 ± 3.3 dB (re background level) at 1 cm. We also found that plastic-wrapped iButtons were slightly more sluggish in recording temperature changes. Control iButtons without plastic wrapping took 13.1 ± 1.1 min to cool from 23 to 6.5°C, and 20.6 ± 1.3 min to re-warm to 23°C, whereas iButtons wrapped in plastic took 10.5 ± 2.4 min longer to reach their final (stable) minimum temperature, and 6.3 ± 3.9 min longer to re-warm to room temperature (Fig. 3). The temporal delay caused by the plastic wrapping resulted in small but significant difference in rates of both cooling (paired *t* test, $t = -8.5$, $P < 0.001$, $df = 4$) and warming ($t = -4.1$, $P = 0.014$, $df = 4$). There was no difference in warm temperatures recorded by wrapped (23.0 ± 0.4) versus unwrapped iButtons (22.9 ± 0.3, paired *t* test, $t = 1.0$, $P = 0.37$, $df = 4$) but there was a small but significant difference in the minimum cold temperature recorded by wrapped (6.2 ± 0.5) versus unwrapped iButtons (7.2 ± 0.4, paired *t* test, $t = -6.3$, $P = 0.003$, $df = 4$).

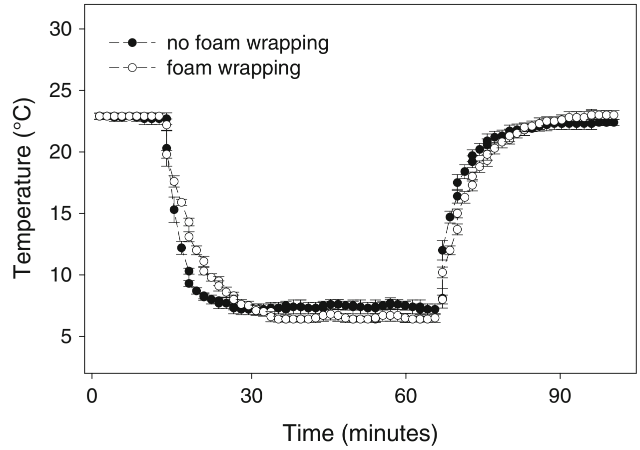

Fig. 3 Mean ± SD temperatures recorded once per minute by iButtons ($n = 5$) acclimated to a 23°C room, then placed in a temperature-controlled cabinet at 7°C for 1 h, and then returned to 23°C room temperature. In one set of measurements, iButtons were wrapped in plastic foam packing material to attenuate the ultrasound emitted by the devices (*open circles*) while in the other set of measurements the iButtons were not wrapped (*filled circles*)

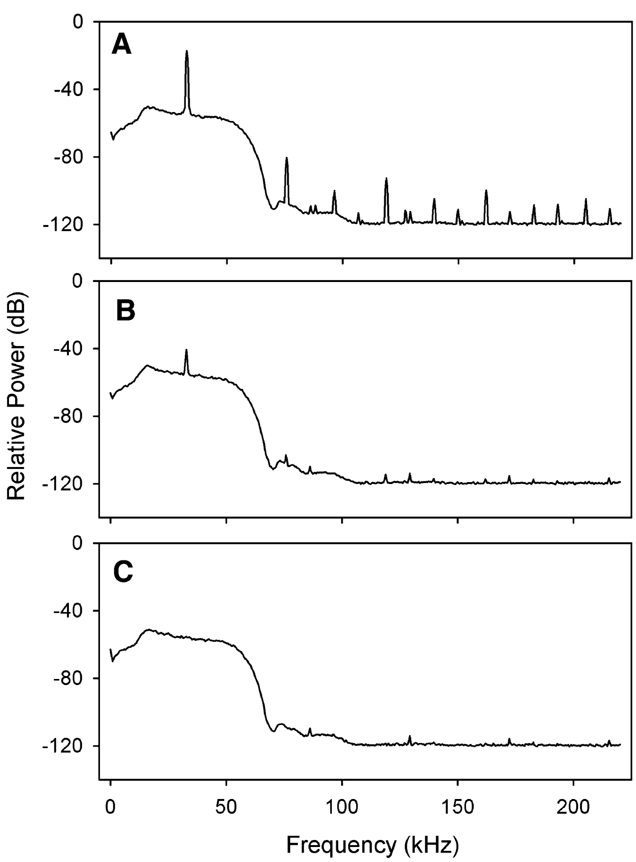

Fig. 2 Fast Fourier transform power spectra of the sound recorded from **a** a DS1921G Thermocron iButton, **b** an iBBat skin temperature datalogger, and **c** the background noise in the anechoic chamber used for recordings at the University of Winnipeg. In **a**, the fundamental frequency of the emitted signal at 32.9 kHz and its higher harmonics can easily be seen

In contrast to iButtons and iBBats, active Holohil temperature-sensitive radio transmitters did not emit ultrasound that could be detected with the D240x bat detector.

Discussion

Our results indicate that most, but not all, Thermocron iButton temperature dataloggers generate electronic ultrasound at a frequency of ~33 kHz and at a maximum amplitude of ~47 dB SPL (re 1 cm). We also found that iBBat dataloggers generate 33 kHz ultrasound, albeit 15–20 dB quieter than iButtons. Ultrasound emissions were not detected in active Holohil temperature-sensitive radio transmitters. Presumably, custom-built devices that employ iButton technology also emit ultrasound (e.g., Landry-Cuerrier et al. 2008; Lovegrove 2009; Robert and Thompson 2003), but this remains to be confirmed. Our measures do not address how the signals were generated nor do we know if the difference in SPL between iButtons and iBBats resulted from signal amplification within the stainless steel housing of intact iButtons (i.e., resonance), or from attenuation of sound passing through the wax/plastic coating on the iBBat exterior (i.e., damping). Additional research is required to address these questions.

We were unable to measure the rms amplitude of every iButton and iBBat we tested in the sound-isolation chamber but our data suggest that there is modest variation in the maximum amplitude of ultrasound emissions even between iButtons of the same model. Interestingly, on several occasions at the Indiana bridge roost—where we first noticed bats that appeared to be avoiding locations with iButtons—we saw 1 or 2 big brown bats roosting immediately adjacent to and even on top of iButtons. This suggests that not every unit emits ultrasound or, alternatively, that the emitted signal is not disturbing to all bats. Nevertheless, the maximum amplitude of iButton and iBBat datalogger sounds we measured varied between 38 and 47 dB SPL (re 1 cm), which is equivalent to residential ambient noise levels and well within the range of auditory sensitivity of many small mammals (Table 1). That datalogger sounds represent a potential source of disturbance for small mammals is cause for concern because the devices may alter the expression of behavioural and physiological traits being monitored. The potential for disturbance may be especially high if an iButton is inserted into an enclosed microhabitat like a burrow, nest or roost cavity where animals may be forced into close contact with the device, or if the device is placed in habitats with extremely low levels of background noise, such as caves. In the case of bats carrying dataloggers, there is also potential for disruption of echolocation ability as extraneous noise can influence prey capture success of bats foraging in a lab (Schaub et al. 2008). Ultrasound disturbance could also impair the ability of individuals carrying dataloggers to interact normally with conspecifics. Social thermoregulation is important for reproduction (Willis and Brigham 2007) and is likely critical for survival during hibernation (Boyles et al. 2008, Boyles and Brack 2009). If individuals carrying dataloggers are rejected by potential cluster-mates, this could severely compromise thermoregulatory ability and survival. Encouragingly, the more recent model of iButton, the DS1922L, produced less intense ultrasound than the DS1921G, and the single DS1921L iButton we examined also produced less intense sound than the DS1921G but at 20 dB above background at 1 cm, well within the range of sensitivity for many small mammals.

Though beyond the scope of this report, additional observations and experiments are required to determine if bats and other mammals alter their behaviour and/or physiology as a result of exposure to electronically generated ultrasonic tones from iButton and iBBat dataloggers. Some observations suggest that, at least for some species of mammals, iBBats may cause relatively little disturbance. For example, Landry-Cuerrier et al. (2008) used both radio transmitters and collar-mounted iBBats (iBCollar, Model 1922L) to monitor torpor and arousal patterns of eastern chipmunks during hibernation. Although they did not specifically look for differences in arousal patterns between individuals carrying the two devices, they presented no evidence to suggest that chipmunks carrying iBCollars behaved differently from those outfitted with radio transmitters. Willis and Brigham (2007) inserted DS1921G iButtons into tree cavities inhabited by big brown bats to monitor roost microclimates. As many as four iButtons were placed into some roosts to monitor spatial variation in microclimate, and encouragingly, no obvious differences in the pattern of roost use or frequency of roost switching was observed for bats living in trees with and without iButtons. On the other hand, some iButtons were occasionally removed from roosts, presumably by red squirrels (*Tamiasciurus sciurus*) that used the cavities when bats were not present. Many sciurids rely on high frequency sounds for communication (e.g., Wilson and Hare 2004), so removal of iButtons from tree cavities may represent a behavioural response by squirrels to ultrasonic disturbance. To our knowledge, behavioural audiograms have not been measured for red squirrels, but fox squirrels (*Sciurus niger*) have a detection threshold of 17 dB SPL at 32 kHz (Jackson et al. 1997, Table 1), a sensitivity that is an order of magnitude lower than the maximum amplitude of iButton ultrasonic emissions.

For iButtons deployed within mammalian roosts or nesting cavities, we recommend wrapping the units with sound attenuating insulation. Our experiment showed that plastic insulation virtually eliminated the 33 kHz ultrasonic tone emitted by iButtons, and caused only a small delay in the measured rates of cooling and warming. Curiously, the wrapping appeared to cause a slight change in accuracy at ~7°C; wrapped dataloggers recorded temperatures about 0.5–1.0°C colder than unwrapped ones, despite exposure to identical T_a. However, the effect did not occur at the higher test T_a (~23°C) and it was consistent for all five iButtons we tested, which suggests that it could be corrected with a simple calibration using a traceable thermometer in a water bath. In some mammalian environments—such as underground burrows, tree and rock crevices, and especially cave hibernacula—microclimate conditions are relatively stable and T_a changes more gradually than in the laboratory conditions we used for our warming/cooling experiment. Thus, insulating units to attenuate ultrasound is likely to have a minor effect on microclimate data collected in the field. We also recommend monitoring dataloggers with a heterodyne bat detector before and after wrapping to confirm that the insulation has attenuated the ultrasound. Prior to surgical implantation, iButtons are typically coated in a biologically inert wax (e.g., Lovegrove 2009). We did not measure the

Table 1 Published values of threshold sensitivity to sounds at 32 kHz for a range of representative mammals (based on behavioural audiograms) and a bird (based on neural recording)

Species	Common name	Threshold at 32 kHz[a]	Reference	Notes
Bats				
Cynopterus brachyotis	Dog-faced fruit bat	18.25	Heffner et al. (2006)	Non-echolocating
Eidolon helvum	Straw-colored fruit bat	36.5	Heffner et al. (2006)	Non-echolocating
Eptesicus fuscus	Big brown bat	11.2	Koay et al. (1997)	
Myotis lucifugus	Little brown bat	18	Dalland (1965)	At 35 kHz
Noctilio leporinus	Greater bulldog bat	5	Wenstrup (1984)	
Primates				
Lemur catta	Ring-tailed lemur	15	Gillette et al. (1973)	
Pan troglodytes	Chimpanzee	83	Kojima (1990)	
Papio cynocephalus	Yellow baboon	23	Hienz et al. (1982)	
Rodents				
Acomys cahirinus	Spiny mouse	31.5	Heffner et al. (2001)	
Mus musculus	House mouse	8	Heffner and Masterton (1980)	
Phyllotus darwinii	Darwin's mouse	24	Heffner and Heffner (1985a)	
Onychomys leucogaster	Grasshopper mouse	27	Heffner and Heffner (1985a)	
Sigmodon hispidus	Cotton rat	10	Heffner and Masterton (1980)	
Tamias striatus	Eastern chipmunk	24	Heffner et al. (2001)	
Sciurus niger	Fox squirrel	17	Jackson et al. (1997)	
Meriones unguiculatis	Mongolian gerbil	17	Ryan (1976)	
Carnivores				
Mustela nivalis	Least weasel	8	Heffner and Heffner (1985b)	
Ungulates				
Sus scrofa	Domestic pig	25	Heffner and Heffner (1990)	
Birds				
Lampornis clemenciae	Blue-throated hummingbird	>90	Pytte et al. (2004)	Tested up to 90 dB with no response

[a] (in dB SPL re 20 μPa)

sound attenuating properties of a wax-coating on iButtons or iBBats, but presumably the wax would also dampen ultrasound emissions.

Miniature temperature dataloggers, like iButtons, are clearly of tremendous value for research on animal metabolism, thermal physiology, habitat selection and hibernation, and we support their use in studying these and other aspects of physiology, behaviour, and ecology. It remains to be determined if iButton dataloggers disturb free-living animals but our preliminary field observations and sound level measurements suggest it is a possibility. Therefore, we also identified a simple solution to reduce or eliminate the likelihood of disturbance in some circumstances. We emphasize that future studies should carefully examine potential influences of any electronic monitoring device on study animals to avoid undue stress on the animals and to avoid disrupting the patterns of physiology and behaviour that we aim to understand.

Acknowledgments We are grateful to Environmental Solutions and Innovations, Inc. who provided iButtons for field studies and R. M. Brigham and J. Kilgour for providing iButtons for laboratory studies. We thank S. Smith for use of a sound isolation booth, J. H. Fullard for use of a sound level meter and band-pass filter, R. Sayegh for assistance with sound measurements, and A. Mann for installing the iButtons in the field. The Indiana Department of Transportation and the Federal Highway Administration provided funds for work at the bridge roost site. J. W. J. was supported by a Natural Sciences and Engineering Research Council (NSERC) of Canada Post-Graduate Scholarship, and J. G. B. was supported by a Cave Conservancy Fellowship (USA). The research of C.-K. R. W. and P. A. F is supported by NSERC Discovery Grants. The McMaster Bat Lab is also supported by grants from the Canada Foundation for Innovation (CFI) and the Ontario Innovation Trust (OIT).

References

Blehert DS, Hicks AC, Behr M, Meteyer CU, Berlowski-Zier BM, Buckles EL, Coleman JTH, Darling SR, Gargas A, Niver R, Okoniewski JC, Rudd RJ, Stone WB (2009) Bat white-nose syndrome: an emerging fungal pathogen? Science 323:227

Boyles JG (2007) Describing roosts used by forest bats: the importance of microclimate. Acta Chiropt 9:297–303

Boyles JG, Brack V Jr (2009) Modeling survival rates of hibernating mammals with individual-based models of energy expenditure. J Mammal 90:9–16

Boyles JG, Willis CKR (2009) Could localized warm areas inside cold caves reduce mortality of hibernating bats affected by white-nose syndrome? Front Ecol Environ. doi:10.1890/080187

Boyles JG, Storm JJ, Brack V Jr (2008) Thermal benefits of clustering during hibernation: a field test of competing hypotheses on *Myotis sodalis*. Funct Ecol 22:632–636

Dalland JI (1965) Hearing sensitivity in bats. Science 150:1185–1186

Davidson AJ, Aujard F, London BMM, Block GD (2003) Thermochron iButtons: an inexpensive method for long-term recording of core body temperature in untethered animals. J Biol Rhythms 18:430–432

Dunbar MB, Tomasi TE (2006) Arousal patterns, metabolic rate and an energy budget of eastern red bats (*Lasiurus borealis*) in winter. J Mammal 87:1096–1102

Fietz J, Schlund W, Dausmann KH, Regelmann M, Heldmaier G (2003) Energetic constraints on sexual activity in the male edible dormouse (*Glis glis*). Oecologia 138:202–209

Freezer JW (2005) Efficacy of thermocron iButtons in assessment of nest-box occupancy by sciuruds. MSc Thesis. Southeast Missouri State University

Geiser F (2004) Metabolic rate and body temperature reduction during hibernation and daily torpor. Annu Rev Physiol 66:239–274

Gillette RG, Brown R, Herman P, Vernon S, Vernon J (1973) The auditory sensitivity of the lemur. Am J Phys Anthropol 38:365–370

Heffner HE, Heffner RS (1985a) Hearing in two cricetid rodents: wood rat (*Neotoma floridana* and grasshopper mouse (*Onychomys leucogaster*). J Comp Psychol 99:275–288

Heffner RS, Heffner HE (1985b) Hearing in mammals: the least weasel. J Mammal 66:745–755

Heffner RS, Heffner HE (1990) Hearing in domestic pig (*Sus scrofa*) and goat (*Capra hircus*). Hear Res 48:231–240

Heffner H, Masterton R (1980) Hearing in glires: domestic rabbit, cotton rat, feral house mouse and kangaroo rat. J Acoust Soc Am 68:154–1599

Heffner RS, Koay G, Heffner HE (2001) Audiograms of five species of rodents: implications for the evolution of hearing and the encoding of pitch. Hear Res 157:138–152

Heffner RS, Koay G, Heffner HE (2006) Hearing in large (*Eidolon helvum*) and small (*Cynopterus brachyotis*) non-echolocating fruit bats. Hear Res 221:17–25

Hienz RD, Turkkan JS, Harris AH (1982) Pure tone thresholds in the yellow baboon (*Papio cynocephalus*) Hear Res 8:71–75

Hill RW, Wyse GA, Anderson M (2008) Animal physiology, 2nd edn. Sinauer Associates Inc., Sunderland

Jackson LL, Heffner HE, Heffner RS (1997) Audiogram of the fox squirrel (*Sciurus niger*). J Comp Psychol 111:100–104

Kalcounis-Rüppell MC, Metheny JD, Vonhof MJ (2006) Production of ultrasonic vocalizations by *Peromyscus* mice in the wild. Front Zool 3:3

Koay G, Heffner HE, Heffner RS (1997) Audiogram of the big brown bat (*Eptesicus fuscus*). Hear Res 105:202–210

Kojima S (1990) Comparison of auditory functions in the chimpanzee and human. Folia Primatol 55:62–72

Landry-Cuerrier M, Munro D, Thomas DW, Humphries MM (2008) Climate and resource dependence of fundamental and realized metabolic niches of hibernating chipmunks. Ecology 89:3306–3316

Lausen CL, Barclay RMR (2006) Benefits of living in a building: big brown bats (*Eptesicus fuscus*) in rocks versus buildings. J Mammal 87:362–370

Lovegrove BG (2009) Modification and miniaturization of thermochron iButtons for surgical implantation into small animals. J Comp Physiol. doi:10.1007/s00360-008-0329-x

Munro D, Thomas DW, Humphries MM (2005) Torpor patterns of hibernating eastern chipmunks (*Tamias striatus*) vary in response to the size and fatty acid composition of food hoards. J Anim Ecol 74:692–700

Mzilikazi N, Lovegrove BG (2004) Daily torpor in free-ranging rock elephant shrews, *Elephantulus myurus*: a year-long study. Physiol Biochem Zool 77:285–296

Mzilikazi N, Lovegrove B (2005) Daily torpor during the active phase in free-ranging rock elephant shrews (*Elephantulus myurus*). J Zool 267:103–111

Neubaum DJ, O'Shea TJ, Wilson KR (2006) Autumn migration and selection of rock crevice as hibernacula by big brown bats in Colorado. J Mammal 87:470–479

Popper AN, Fay RR (eds) (1995) Hearing by bats. Springer, New York

Pytte CL, Ficken MS, Moiseff A (2004) Ultrasonic singing by the blue-throated hummingbird: a comparison between production and perception. J Comp Physiol A 190:665–673

Robert KA, Thompson MB (2003) Reconstructing thermochron iButtons to reduce size and weight as a new technique in the study of small animal thermal biology. Herpetol Rev 34:130–132

Ryan A (1976) Hearing sensitivity of the Mongolian gerbil, *Meriones unguiculatis*. J Acoust Soc Am 59:1222–1226

Sales G, Pye D (1974) Ultrasonic communication by animals. Chapman & Hall, London

Schaub A, Ostwald J, Siemers BM (2008) Foraging bats avoid noise. J Exp Biol 211:3174–3180

Schiek B, Rolfes I, Siweris H-J (2006) Noise in high-frequency circuits and oscillators. Wiley, Hoboken

Seebacher F, Guderley H, Elsey RM, Trosclair PL (2003) Seasonal acclimatisation of muscle enzymes in a reptile (*Alligator mississippiensis*). J Exp Biol 206:1193–1200

Sewell GD (1970) Ultrasonic communication in rodents. Nature 227:410

Solick DI, Barclay RMR (2006) Thermoregulation and roosting behaviour of reproductive and nonreproductive female western long-eared bats (*Myotis evotis*) in the Rocky Mountains of Alberta. Can J Zool 84:589–599

Solick DI, Barclay RMR (2007) Geographic variation in the use of torpor and roosting behaviour of female western long-eared bats. J Zool 272:358–366

Warnecke L, Withers PC, Schleucher E, Maloney SK (2007) Body temperature variation of free-ranging and captive southern bandicoots *Isoodon obesulus* (Marsupialia: Peramelidae). J Therm Biol 43:72–77

Warner DA, Shine R (2007) Maternal nest-site choice in a lizard with temperature-dependent sex determination. Anim Behav 75:861–870

Wenstrup JJ (1984) Auditory sensitivity in the fish-catching bat, *Noctilio leporinus*. J Comp Physiol 155:91–101

Willis CKR, Brigham RM (2005) Physiological and ecological aspects of roost selection by reproductive female hoary bats (*Lasiurus cinereus*). J Mammal 86:85–94

Willis CKR, Brigham RM (2007) Social thermoregulation exerts more influence than microclimate on forest roost preferences by a cavity-dwelling bat. Behav Ecol Sociobiol 62:97–108

Willis CKR, Goldzieher A, Geiser F (2005) A non-invasive method for quantifying patterns of torpor and activity under semi-natural conditions. J Therm Biol 30:551–556

Willis CKR, Brigham RM, Geiser F (2006) Deep, prolonged torpor by pregnant free-ranging bats. Naturwissenschaften 93:80–83

Wilson DR, Hare JF (2004) Ground squirrel uses ultrasonic alarms. Nature 430:523

Withers PC (1992) Comparative animal physiology. Saunders, Fort Worth

Zar JH (1984) Biostatistical analysis. Prentice Hall, Englewood Cliffs

APPENDIX D

I-69 Northern Long-Eared Bat Capture Data (2004-14)

Appendix D: I-69 Northern Long-Eared Bat Capture Data (2004-14)

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
1	2008	4	13-Jul-08	Male	Juvenile	Non-descended	34.5	5.8
	2011	3	11-Jun-11	Female	Adult	Pregnant	36.3	9.8
		4	20-May-11	Female	Adult	Pregnant	34.1	6.5
		5	21-May-11	Male	Adult	Descended	36	6
	2012	4C	31-May-12	Male	Adult	Non-descended	35	5.6
2	2004	13	11-Aug-04	Female	Adult		34.6	6.5
		10A	29-Jul-04	Female	Adult	Non-Reproductive	38	7.8
		11	29-Jul-04	Female	Adult	Non-Reproductive	36	7.1
		5	27-Jul-04	Female	Adult	Non-Reproductive	37	7.7
			27-Jul-04	Female	Adult	Non-Reproductive	34	6.2
			27-Jul-04	Female	Adult	Non-Reproductive	34	6.7
			27-Jul-04	Female	Adult	Non-Reproductive	35	7.7
			27-Jul-04	Female	Adult	Non-Reproductive	35	6.7
			28-Jul-04	Female	Adult	Non-Reproductive	35	6.6
		6	29-Jul-04	Female	Adult	Non-Reproductive	36.1	6
		21	23-Jul-04	Female	Adult	Post-lactating	36	7.3
		4	29-Jul-04	Male	Adult	Non-descended	35	7.5
		5	28-Jul-04	Male	Adult	Non-descended	32	5.3
			27-Jul-04	Male	Juvenile	Non-descended	36.5	6.7
	2005	12.2	04-Aug-05	Female	Adult	Non-Reproductive	36	7.5
		22.2	01-Aug-05	Female	Adult	Non-Reproductive	35	7
		22.4	03-Aug-05	Female	Adult	Non-Reproductive	36	6.5
		22.5	03-Aug-05	Female	Adult	Post-lactating	36	6.6
		22.4	02-Aug-05	Male	Adult	Non-descended	35.5	5.2
			02-Aug-05	Male	Adult	Non-descended	34	5.95
	2010	22	21-Jun-10	Female	Adult	Lactating	39	9
			02-Aug-10	Female	Adult	Post-lactating	35.3	6.5
		12B	28-May-10	Male	Adult	Non-descended	36	6.5
			28-May-10	Male	Adult	Non-descended	37	
		22	29-Jun-10	Male	Adult	Non-descended	36	8
			02-Aug-10	Male	Adult	Non-descended	35	7
	2011	12	30-May-11	Female	Adult	Pregnant	34.5	7.7
		7	24-May-11	Female	Adult	Pregnant	36	9
		22	30-Jul-11	Male	Adult	Descended	34	5.5
		12	31-May-11	Male	Adult	Non-descended	36	6.5
		30	02-Jun-11	Male	Adult	Non-descended	36	6.75
		8	29-May-11	Male	Adult	Non-descended	34	5.8
			29-May-11	Male	Adult	Non-descended	36	5.75

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
2	2012	12	27-May-12	Female	Adult	Lactating	36	7.4
			28-May-12	Female	Adult	Lactating	35	7
		12B	27-May-12	Female	Adult	Pregnant	38	8.5
		12	28-May-12	Male	Adult	Non-descended	33	6.2
		14	27-May-12	Male	Adult	Non-descended	35	5.7
		6	28-May-12	Male	Adult	Non-descended	35	6.7
3	2004	14	29-Jun-04					
		15	15-Jul-04					
		18	30-Jun-04				34	
		21	10-Jun-04					
			10-Jun-04					
		12	29-Jun-04	Female	Adult	Lactating	36	6.3
		13	08-Jul-04	Female	Adult	Lactating	36	6.6
		14	24-Jun-04	Female	Adult	Lactating	37	6.6
			29-Jun-04	Female	Adult	Lactating	36	7.8
			29-Jun-04	Female	Adult	Lactating	37	6.4
			29-Jun-04	Female	Adult	Lactating	36	7.2
			29-Jun-04	Female	Adult	Lactating	36	6.5
			29-Jun-04	Female	Adult	Lactating	38	7.1
		18	30-Jun-04	Female	Adult	Lactating	34	8.3
			30-Jun-04	Female	Adult	Lactating	34	7.7
			30-Jun-04	Female	Adult	Lactating	33	7.5
		2	23-Jun-04	Female	Adult	Lactating	36	6.4
		5	02-Jun-04	Female	Adult	Lactating	37	8.1
		11	17-May-04	Female	Adult	Pregnant	32	9.1
		18	18-May-04	Female	Adult	Pregnant	35	9
			18-May-04	Female	Adult	Pregnant	34	9.3
			18-May-04	Female	Adult	Pregnant	35	9.6
		5	02-Jun-04	Female	Adult	Pregnant	36	8.1
		8	01-Jun-04	Female	Adult	Pregnant	36	10.8
			01-Jun-04	Female	Adult	Pregnant	33	8.7
		15	15-Jul-04	Female	Adult	Post-lactating	34	7
		11	17-May-04	Male	Adult	Non-descended	34	7.3
			17-May-04	Male	Adult	Non-descended	31	6.9
		14	29-Jun-04	Male	Adult	Non-descended	35	5
		18	18-May-04	Male	Adult	Non-descended	35	7.2
			18-May-04	Male	Adult	Non-descended	36	7.4
			18-May-04	Male	Adult	Non-descended	33	7.5
			30-Jun-04	Male	Adult	Non-descended	34	7.6
		20	10-Jun-04	Male	Adult	Non-descended	46	5.7

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
3	2004	14	29-Jun-04	Male	Juvenile	Non-descended	35	5.2
	2005	14.2	08-Aug-05	Female	Adult		37.5	7.3
		14.1	09-Aug-05	Female	Adult	Non-Reproductive	36	6
		14.3	08-Aug-05	Female	Adult	Non-Reproductive	36	7.5
			08-Aug-05	Female	Adult	Non-Reproductive	36	5.5
		14.4	09-Aug-05	Female	Adult	Non-Reproductive	37	
		14.6	10-Aug-05	Female	Adult	Non-Reproductive	34	6
		14.4	09-Aug-05	Female	Adult	Post-lactating	35	
		14.1	09-Aug-05	Male	Adult	Non-descended	35	6
		14.3	09-Aug-05	Male	Adult	Non-descended	35	6
		14.4	09-Aug-05	Male	Adult	Non-descended	35	
	2010	13	23-Jun-10	Female	Adult	Lactating	36	7.75
			25-Jun-10	Female	Adult	Lactating	35.3	7
			25-Jun-10	Female	Adult	Lactating	6.5	6.5
		22	28-Jun-10	Female	Adult	Lactating	36.5	7.75
			28-Jun-10	Female	Adult	Lactating	37	8.25
			28-Jun-10	Female	Adult	Lactating	37	8
			28-Jun-10	Female	Adult	Lactating	34	7.25
			28-Jun-10	Female	Adult	Lactating	38	6.75
			28-Jun-10	Female	Adult	Lactating	37	8
		14	07-Aug-10	Female	Adult	Post-lactating	35	7
			09-Aug-10	Female	Adult	Post-lactating	35	35
			09-Aug-10	Female	Adult	Post-lactating	35.2	35.2
		15	10-Aug-10	Female	Adult	Post-lactating	35.3	7.5
		13	23-Jun-10	Male	Adult	Non-descended	37	7
		18	25-Jun-10	Male	Adult	Non-descended	34	6
		22	28-Jun-10	Male	Adult	Non-descended	34.5	6.75
			28-Jun-10	Male	Adult	Non-descended	36	8
		11	24-Jun-10	Male	Juvenile	Non-descended	34	6
		13	23-Jun-10	Male	Juvenile	Non-descended	33.5	6
	2011	18	05-Aug-11	Female	Adult	Non-Reproductive	34.3	6.25
		13	22-Jul-11	Female	Adult	Post-lactating	34	6.75
		14	23-Jul-11	Female	Adult	Post-lactating	37	8
		15	23-Jul-11	Female	Adult	Post-lactating	33	6
		19	08-Aug-11	Female	Adult	Post-lactating	34.5	5.5
		11	22-Jul-11	Female	Juvenile	Non-Reproductive	36	7
			22-Jul-11	Female	Juvenile	Non-Reproductive	34	6.5
		13	22-Jul-11	Female	Juvenile	Non-Reproductive	34	7
			23-Jul-11	Female	Juvenile	Non-Reproductive	35	11
		14	23-Jul-11	Female	Juvenile	Non-Reproductive	33.5	6

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
3	2011	14	23-Jul-11	Female	Juvenile	Non-Reproductive	38	
			24-Jul-11	Female	Juvenile	Non-Reproductive	39	8
		15	23-Jul-11	Female	Juvenile	Non-Reproductive	33	6
		14	23-Jul-11	Male	Adult		34	7
			23-Jul-11	Male	Adult	Descended	35	5.9
			24-Jul-11	Male	Adult	Non-descended	36	10
		11	22-Jul-11	Male	Juvenile	Descended	32	8.2
		14	23-Jul-11	Male	Juvenile	Non-descended	36	6
			23-Jul-11	Male	Juvenile	Non-descended	3.5	7.5
		15	23-Jul-11	Male	Juvenile	Non-descended	33	6
			23-Jul-11	Male	Juvenile	Non-descended	32	6
	2012		23-May-12	Female	Adult	Non-Reproductive	38	8.5
		21	25-May-12	Female	Adult	Non-Reproductive	38	8.3
		11	23-May-12	Female	Adult	Pregnant	35	8.8
			23-May-12	Female	Adult	Pregnant	35	9.2
			24-May-12	Female	Adult	Pregnant	38	9
		15	23-May-12	Female	Adult	Pregnant	36	9
			23-May-12	Female	Adult	Pregnant	36	9
			23-May-12	Female	Adult	Pregnant	36	9
			24-May-12	Female	Adult	Pregnant	38	7.9
			24-May-12	Female	Adult	Pregnant	56	10.2
			24-May-12	Female	Adult	Pregnant	36	10.5
			24-May-12	Female	Adult	Pregnant	37	9.2
			24-May-12	Female	Adult	Pregnant	38	10.3
			24-May-12	Female	Adult	Pregnant	39	9.5
			24-May-12	Female	Adult	Pregnant	38	10.5
			24-May-12	Female	Adult	Pregnant	37	9
		21	25-May-12	Female	Adult	Pregnant	37	10
		14	24-May-12	Male	Adult	Descended	35	7
		15	24-May-12	Male	Adult	Descended	36	7
			24-May-12	Male	Adult	Descended	38	8
		19	25-May-12	Male	Adult	Descended	34	6.4
		15	23-May-12	Male	Adult	Non-descended	39	7.8
			24-May-12	Male	Adult	Non-descended	37	7.5
			24-May-12	Male	Adult	Non-descended	38	8
			24-May-12	Male	Adult	Non-descended	38	7.5
			24-May-12	Male	Adult	Non-descended	38	8
			24-May-12	Male	Adult	Non-descended	37	6.2
		19	25-May-12	Male	Adult	Non-descended	34	6.6
		21	26-May-12	Male	Adult	Non-descended	35	7.3

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
3	2013	15	15-May-13	Female	Adult	Non-Reproductive	36.1	7.8
		11	20-May-13	Female	Adult	Pregnant	35	7.75
4	2004	25	06-Jul-04		Adult			
			06-Jul-04	Female	Adult	Lactating	33.8	7
			06-Jul-04	Female	Adult	Lactating	34.2	7.5
			06-Jul-04	Female	Adult	Lactating	32.5	7
		4	08-Jun-04	Female	Adult	Lactating	35	7.8
		23	26-Jun-04	Female	Adult	Non-Reproductive	34.1	7.5
		1	06-Jun-04	Female	Adult	Pregnant	38	9
		3	08-Jun-04	Female	Adult	Pregnant	36	8.4
		17	24-Jun-04	Female	Adult	Post-lactating	33	6.4
		23	28-Jun-04	Female	Adult	Post-lactating	36	7.2
		25	06-Jul-04	Female	Adult	Post-lactating	36.5	7.5
			07-Jul-04	Female	Adult	Post-lactating	34.8	6.5
		29	07-Aug-04	Female	Adult	Post-lactating	34	6.9
		25	06-Jul-04	Female	Juvenile	Non-Reproductive	32.9	6.5
			07-Jul-04	Female	Juvenile	Non-Reproductive	34.4	6
		7	16-Jun-04	Male	Adult	Descended	35	6.2
			17-Jun-04	Male	Adult	Descended	34	5.5
		1	05-Jun-04	Male	Adult	Non-descended	34	7.6
		10	16-Jun-04	Male	Adult	Non-descended	39.5	6.5
		11	17-Jun-04	Male	Adult	Non-descended	35.5	6.2
		12	20-Jun-04	Male	Adult	Non-descended	35	6.5
		14	22-Jun-04	Male	Adult	Non-descended	36	5.9
			22-Jun-04	Male	Adult	Non-descended	35	5.6
			23-Jun-04	Male	Adult	Non-descended	35.5	6.8
		16	03-Jun-04	Male	Adult	Non-descended	34	6.1
			03-Jun-04	Male	Adult	Non-descended	38	7.1
			03-Jun-04	Male	Adult	Non-descended	37	7.2
		17	23-Jun-04	Male	Adult	Non-descended	35	6.15
			24-Jun-04	Male	Adult	Non-descended	33.5	6.2
		2	05-Jun-04	Male	Adult	Non-descended	35	6.4
			06-Jun-04	Male	Adult	Non-descended	32	6.4
			06-Jun-04	Male	Adult	Non-descended	35	5.8
		23	26-Jun-04	Male	Adult	Non-descended	33.3	6.5
		24	16-Jul-04	Male	Adult	Non-descended	33.9	7
		25	06-Jul-04	Male	Adult	Non-descended	34.2	6
			07-Jul-04	Male	Adult	Non-descended	31.6	6.5
		27	12-Jul-04	Male	Adult	Non-descended	32.8	6
		3	08-Jun-04	Male	Adult	Non-descended	37	6.2

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
4	2004	5	09-Jun-04	Male	Adult	Non-descended	35	6.6
			09-Jun-04	Male	Adult	Non-descended	34	5.8
			11-Jun-04	Male	Adult	Non-descended	34	7
		6	22-Jun-04	Male	Adult	Non-descended	34.1	7.5
			23-Jun-04	Male	Adult	Non-descended	33.1	6.5
		7	17-Jun-04	Male	Adult	Non-descended	36	6.8
		8	20-Jun-04	Male	Adult	Non-descended	35.5	6.75
	2005	2.2	12-Aug-05					
		23.1	15-Aug-05	Female	Adult		36.5	7.5
			15-Aug-05	Female	Adult	Non-Reproductive	34	6.5
			15-Aug-05	Female	Adult	Non-Reproductive	36	6.7
		11.4	14-Aug-05	Female	Juvenile	Non-Reproductive	35	6.25
		2.2	12-Aug-05	Female	Juvenile	Non-Reproductive	36	6.4
		23.2	11-Aug-05	Female	Juvenile	Non-Reproductive	35	5.7
		11.4	14-Aug-05	Male	Adult	Descended	34	6.5
			14-Aug-05	Male	Adult	Descended	35	6
		2.2	12-Aug-05	Male	Adult	Descended	37	6.2
			12-Aug-05	Male	Adult	Descended	34	5.6
			13-Aug-05	Male	Adult	Descended	35	5.6
			13-Aug-05	Male	Adult	Descended		
		23.1	15-Aug-05	Male	Adult	Descended	35.5	6.6
		23.3	11-Aug-05	Male	Adult	Descended	36.5	5.3
		11.1	12-Aug-05	Male	Adult	Non-descended	34	6
			12-Aug-05	Male	Adult	Non-descended	35	6
			12-Aug-05	Male	Adult	Non-descended	36	5.5
			12-Aug-05	Male	Adult	Non-descended	35	6
		11.4	14-Aug-05	Male	Adult	Non-descended	34	6.5
		23.2	11-Aug-05	Male	Adult	Non-descended	36	6.4
		23.4	11-Aug-05	Male	Adult	Non-descended	35	5
		23.5	11-Aug-05	Male	Adult	Non-descended	36	6.5
		23.4	11-Aug-05	Male	Juvenile	Non-descended	34	5
	2010	2	29-Jul-10	Female	Adult	Non-Reproductive		
		3	30-Jul-10	Female	Adult	Post-lactating		
		2	29-Jul-10	Male	Adult	Descended		
		3	31-Jul-10	Male	Adult	Non-descended		
	2011	18	21-Jul-11	Female	Adult	Lactating		
			20-Jul-11	Male	Adult	Non-descended		
			21-Jul-11	Male	Adult	Non-descended		
	2012	23	04-Jun-12	Female	Adult	Lactating		
		18	06-Jun-12	Male	Adult	Non-descended		

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
4	2012	2	14-Jun-12	Male	Adult	Non-descended		
		28	18-May-12	Male	Adult	Non-descended		
			19-May-12	Male	Adult	Non-descended		
	2013	23	21-Jun-13	Female	Adult	Lactating		
			23-Jun-13	Female	Adult	Lactating		
		18	29-Jun-13	Male	Adult	Non-descended		
		23	21-Jun-13	Male	Adult	Non-descended		
5	2004	13	15-Jun-04	Female	Adult	Lactating	36.75	8.4
			15-Jun-04	Female	Adult	Lactating	37.35	7.5
		15	22-Jun-04	Female	Adult	Lactating	35.65	7.2
		9	27-Jun-04	Female	Adult	Lactating	37.45	6.9
			27-Jun-04	Female	Adult	Lactating	36.7	6.2
			27-Jun-04	Female	Adult	Lactating	35.05	6.3
		24	11-Jul-04	Female	Adult	Non-Reproductive	37	6.25
		19	17-Jul-04	Female	Adult	Post-lactating	38	7.12
		24	11-Jul-04	Female	Adult	Post-lactating	36.1	6.5
		20	05-Jul-04	Female	Juvenile	Non-Reproductive	34.2	5.7
			05-Jul-04	Female	Juvenile	Non-Reproductive	35.3	6.4
		24	11-Jul-04	Female	Juvenile	Non-Reproductive	35.75	6
		9	27-Jun-04	Female	Juvenile	Non-Reproductive	36.1	5.5
			28-Jun-04	Female	Juvenile	Non-Reproductive	34.25	5.4
			28-Jun-04	Female	Juvenile	Non-Reproductive	35.9	6.4
		24	11-Jul-04	Male	Adult	Descended	36	6.75
		11	18-Jul-04	Male	Adult	Non-descended	33.8	5.25
		12	07-Jun-04	Male	Adult	Non-descended	36.05	7
			09-Jun-04	Male	Adult	Non-descended	33.15	5.5
		17	20-Jun-04	Male	Adult	Non-descended	35.7	6.7
		19	17-Jul-04	Male	Adult	Non-descended	36.25	6
		2	11-Jun-04	Male	Adult	Non-descended	36.2	7.5
			11-Jun-04	Male	Adult	Non-descended	33.4	5.8
		24	11-Jul-04	Male	Adult	Non-descended	34.6	6.25
		3	03-Jun-04	Male	Adult	Non-descended	33.9	5.5
			03-Jun-04	Male	Adult	Non-descended	34.05	6.5
		4	02-Jul-04	Male	Adult	Non-descended	35.1	5.9
		5	10-Jul-04	Male	Adult	Non-descended	35.15	7.4
		18	07-Jul-04	Male	Juvenile	Non-descended	34.4	5
		9	28-Jun-04	Male	Juvenile	Non-descended	37.2	6.3
	2005	16	19-Jul-05	Male	Adult	Non-descended	34.65	6
	2012	14	18-May-12	Female	Adult	Pregnant	36	8.5
		17	18-May-12	Female	Adult	Pregnant	37	9.5

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
5	2012	19	20-May-12	Female	Adult	Pregnant	35.5	7.5
			21-May-12	Female	Adult	Pregnant	36	8.6
		21	20-May-12	Female	Adult	Pregnant	36	9.5
			20-May-12	Female	Adult	Pregnant	37	10
		22	20-May-12	Female	Adult	Pregnant	36	8.5
			20-May-12	Female	Adult	Pregnant	35	6.5
			20-May-12	Female	Adult	Pregnant	35	9.3
			21-May-12	Female	Adult	Pregnant	35	9.4
		7	17-May-12	Female	Adult	Pregnant	35	8.1
		9	15-May-12	Female	Adult	Pregnant	35	8.9
			16-May-12	Female	Adult	Pregnant	34	7.7
			16-May-12	Female	Adult	Pregnant	36	7.6
		13	15-May-12	Male	Adult	Descended	35	6.75
		17	19-May-12	Male	Adult	Descended	37	6
		13	16-May-12	Male	Adult	Non-descended	36	8.5
		14	18-May-12	Male	Adult	Non-descended	35	7.2
			18-May-12	Male	Adult	Non-descended	34	6.1
			19-May-12	Male	Adult	Non-descended	32.5	6.3
		15	15-May-12	Male	Adult	Non-descended		
		17	17-May-12	Male	Adult	Non-descended	57	7.5
			18-May-12	Male	Adult	Non-descended	34	6
			19-May-12	Male	Adult	Non-descended	34	7.6
		2	15-May-12	Male	Adult	Non-descended	34	5.5
			15-May-12	Male	Adult	Non-descended	36	6
			16-May-12	Male	Adult	Non-descended	33	6
		21	20-May-12	Male	Adult	Non-descended	36	6.5
		22	20-May-12	Male	Adult	Non-descended	34	6
		3	16-May-12	Male	Adult	Non-descended	36	5.5
		4	21-May-12	Male	Adult	Non-descended	35	5.6
			21-May-12	Male	Adult	Non-descended	34.5	6
			21-May-12	Male	Adult	Non-descended	36	6.2
		8	15-May-12	Male	Adult	Non-descended	34	6
	2014	24	24-May-14	Male	Adult	Non-descended	34.5	5.95
		6	21-May-14	Male	Adult	Non-descended	36	7.5
6	2004	10	12-Jul-04	Female	Adult	Non-Reproductive	39	9.5
		20	20-Jul-04	Female	Adult	Post-lactating	36	
		6	28-Jul-04	Female	Adult	Post-lactating	37	7
			26-Jul-04	Female	Juvenile	Non-Reproductive	37	6
			26-Jul-04	Female	Juvenile	Non-Reproductive	37	7
			28-Jul-04	Female	Juvenile	Non-Reproductive	38	7

Section	Year	Site	Date	Gender	Adult/ Juvenile	Reproductive Status	RFA (mm)	Weight (g)
6	2004	14	18-Jul-04	Male	Adult	Descended	35	6
		20	20-Jul-04	Male	Adult	Descended	35	6.5
			20-Jul-04	Male	Adult	Descended	34	6
		12	17-Jul-04	Male	Adult	Non-descended	34	6
			18-Jul-04	Male	Adult	Non-descended	35	7
			18-Jul-04	Male	Adult	Non-descended	34	6
		15	18-Jul-04	Male	Adult	Non-descended	38	6
		19	19-Jul-04	Male	Adult	Non-descended	35	6
		21	21-Jul-04	Male	Adult	Non-descended	33	6
			23-Jul-04	Male	Adult	Non-descended	31	6
		24	19-Jul-04	Male	Adult	Non-descended	36	7
		5	12-Jul-04	Male	Adult	Non-descended	32	6
		25	21-Jul-04	Male	Juvenile	Non-descended	38	7
		6	26-Jul-04	Male	Juvenile	Non-descended	36	7
			28-Jul-04	Male	Juvenile	Non-descended	37	7
	2005	19	12-Jul-05	Female	Adult	Lactating	35.35	7
		10	14-Jul-05	Female	Juvenile	Non-Reproductive	36.05	6.25
			14-Jul-05	Female	Juvenile	Non-Reproductive	34.8	6.5
		23	18-Jul-05	Female	Juvenile	Non-Reproductive	34.65	5.75
		7	17-Jul-05	Female	Juvenile	Non-Reproductive	36.7	6.25
		23	18-Jul-05	Male	Adult	Non-descended	35.55	6.25

APPENDIX E

<u>Confidential</u>

SECTION 1

Appendix E has been redacted in its entirety to maintain the confidentiality of the data contained within.

APPENDIX F

Winter Action Area Cave Foraging Area Analysis (Sections 4 and 5)

Confidential

Appendix F has been redacted in its entirety to maintain the confidentiality of the data contained within.

Exhibits

Exhibit 1
I-69 Effort, Distribution and Seasonality

Exhibit 2
I-69 Maternity Colonies, Roost Trees and Mitigation

Exhibit 3
Northern Long-Eared Bat Colonies and I-69 Mitigation Sites

Exhibits have been redacted in their entirety to maintain the confidentiality of the data contained within.

Conference Opinion for the Northern Long-eared Bat (*Myotis septentrionalis*)

Amendment 3 to the Tier 1 Revised Programmatic Biological Opinion (dated August 24, 2006, previously amended July 24, 2013 and May 25, 2011) for the I-69, Evansville to Indianapolis, Indiana highway.

April 1, 2015

This document has been prepared for the I-69 Evansville to Indianapolis Project. The Federal Highway Administration (FHWA) has used a tiered environmental review process for this project. The U.S. Fish and Wildlife Service (Service) issued a Tier 1 Biological Opinion (BO) in December of 2003, and shortly afterward FHWA issued the Tier 1 Final Environmental Impact Statement (FEIS). FHWA issued a Tier 1 Record of Decision (ROD) on March 24, 2004, and then initiated Tier 2 EISs for each of the six sections of the approved corridor (known as I-69 Sections 1 through 6).

The Service issued a revised Tier 1 Programmatic BO (RPBO) in August of 2006 for the entire corridor. The revised Tier 1 RPBO requires a separate BO for each of the six sections of the project. Tier 2 BOs have been issued for Section 1 (August 29, 2007), Section 2 (February 17, 2010), Section 3 (October 21, 2009), Section 4 (July 6, 2011), and Section 5 (July 25, 2013). Consultation on the entire corridor was reinitiated in 2011 in order to update baseline information (including new maternity colony data and white nose syndrome information), as well as the impact analysis for , which is designated Critical Habitat for the Indiana bat. Consultation on the entire corridor was also reinitiated in 2013 to address additional forest and wetland impacts, as well as new Indiana bat maternity colony information. For a complete summary of the project's consultation history, please refer to Table 2 of the 2014 Tier 1 Biological Assessment Addendum for the Northern Long-Eared Bat (NLEB BA).

Presently, a conference on the entire corridor has been initiated due to the presence of the northern long-eared bat (*Myotis septentrionalis*), which is proposed to be listed in April, 2015, as endangered under the Endangered species Act (ESA) of 1973 (as amended). The Service has prepared this Conference Opinion (CO) and is amending it (as Amendment 3) to the 2006 Tier 1 RPBO.

New Information/Need for Formal Conference

On October 2, 2013, the U.S. Fish and Wildlife Service (FWS) proposed the northern long-eared bat (*Myotis septentrionalis*) (NLEB) for listing as endangered under the ESA. A proposed species is any species where a proposed listing rule under section 4 of the ESA has been published in the Federal Register. For species that have been proposed for listing, the FWS has determined that there is enough information to warrant listing them as either threatened or endangered. The NLEB was proposed for federal listing under the ESA on October 2, 2013 and the final listing decision was expected within one year from that date. Recently, the FWS published a Federal Register notice announcing a 6-month extension of the deadline for making a final determination on listing the northern long-eared bat (*Myotis septentrionalis*) as endangered. With the extension, the Service will make a final decision no later than April 2, 2015.

While there is no prohibition for “taking” proposed species, there are certain statutory requirements under the ESA for proposed species. Section 7(a)(4) of the ESA states, "Each Federal agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed or result in the destruction or adverse modification of critical habitat proposed to be designated for such species.” Conference is a process of early interagency cooperation involving informal and/or formal discussions between the action agency and the FWS pursuant to section 7(a)(4) of the ESA regarding the likely impact of an action on proposed species or proposed critical habitat.

While consultation under Section 7 of the ESA is required when a proposed action “may affect” a *listed* species, a conference is required only if the proposed action is likely to jeopardize the continued existence of a proposed species or destroy or adversely modify proposed critical habitat. The Conference process is discretionary for all other effect determinations besides jeopardy/adverse modification. However, it is in the best interest of the species, and our federal partners to consider the value of voluntary conservation measures in a conference opinion or conference report for projects that are not likely to cause jeopardy, but are likely to adversely affect the NLEB.

Action agencies are not prohibited from unauthorized taking or jeopardizing the continued existence of a proposed species until the species becomes listed. However, as soon as the listing becomes effective, the section 7(a)(2) prohibition becomes effective 30 days after the publication of the final rule, regardless of an action’s stage of completion. Because of this, the timing of the proposed action should influence whether an informal or formal conference is conducted. Action agencies/applicants may experience significant project delays if the NLEB has not been addressed, either formally or informally, if the species is listed.

Although not required, for projects that may adversely affect the NLEB, formal conference is advisable if the action will be ongoing subsequent to the listing. This is appropriate because, even though the proposed action may not result in jeopardy to the NLEB, the prohibition against taking a listed species under section 9 of the ESA (in addition to the prohibition against jeopardy) will apply as soon as the listing becomes effective (30 days after publication of the final rule), regardless of the proposed action’s stage of completion. Therefore, formal conference and the issuance of a conference opinion that can be adopted as the biological opinion on the proposed action, should allow the project to proceed with little delay once the NLEB becomes listed. The conference opinion can then be adopted after listing as a biological opinion without interruption in the action, if both the FWS and action agency agree. If the NLEB becomes listed prior to project completion and the action agency has not conferred with the FWS, the action agency would need to cease action on the project and enter into formal consultation with the

FWS if the action is likely to adversely affect the NLEB. This approach has the potential to result in significant delays and costs to applicants.

Formal conferences follow the same procedures as formal consultation and end with the issuance of a conference opinion. The conference opinion follows the same format and content of a biological opinion; however, the incidental take statement provided with the conference opinion for the NLEB does not take effect until the FWS and action agency adopt the conference opinion as a biological opinion on the proposed action, once the NLEB is listed. Based on the timing of the conference and the effective listing date of May 4, 2015, the Service has concluded that this conference opinion shall be immediately adopted as a biological opinion upon the effective listing date of May 4, 2015.

CONFERENCE OPINION

PROPOSED ACTION

The Federal Highway Administration (FHWA) and the Indiana Department of Transportation (INDOT) are constructing the I-69 Interstate from Evansville to Indianapolis, Indiana. It is a comprehensive National Environmental Policy Act (NEPA) study that was and will be carried forward in two tiers. Tier 1 of the study involved extensive environmental, transportation, and economic studies, and cost analysis. The Tier 1 Environmental Impact Statement (EIS) provided a basis for the FHWA to grant approval for a specific *corridor*. In most cases, the *corridor* is approximately 2,000 feet wide, but has been narrowed or widened in some instances to avoid or provide flexibility to avoid environmentally sensitive areas. A working alignment within the *corridor*, ranging from approximately 270 – 470 feet wide, was developed to estimate potential impacts for the Tier 1 study. The Tier 1 study was completed on March 24, 2004 with the issuance of the Tier 1 Record of Decision (ROD) signed by FHWA. Alternative 3C was the Selected Alternative for this project. Alternative 3C is near SR 57 from Evansville to Washington, crossing the Patoka River National Wildlife Refuge acquisition boundary. The alternative continues to the east of Washington north to Elnora, then turns east overland toward Bloomington. From Bloomington north, the alternative is located on existing SR 37 to connect to I-465 at Indianapolis.

The proposed action consists of construction, operation, and maintenance of an interstate highway, approximately 142 miles long, connecting Evansville and Indianapolis, Indiana. Approximately 35% of the proposed route is primarily within the footprint of an existing 4-lane highway, SR 37; however, the remaining 65% or approximately 90 miles of interstate is being constructed on entirely new right-of-way. The proposed action also involves constructing multiple interchanges (the actual number may change in Tier 2), as well as new local access roads, and improvements to existing roads. The project is part of a larger, national proposal to connect the three North American trading partners of Canada, the United States, and Mexico by an interstate highway in the states of Michigan, Indiana, Kentucky, Tennessee, Mississippi, Arkansas, Louisiana, and Texas. The purpose of the I-69 Evansville to Indianapolis Project is to provide an improved transportation link between Evansville and Indianapolis that: 1) strengthens the transportation network in southwestern Indiana, 2) supports economic development in southwestern Indiana, and 3) completes the portion of the National I-69 project between Evansville and Indianapolis.

At this time, Tier 2 NEPA documents and BAs (with corresponding BOs from the Service) have been completed for Sections 1-5, and construction of the roadway is completed for Sections 1-3 or the first 67 miles. Clearing of trees is completed for Section 4 and the lower third of Section 5. Construction of the highway in Section 4 is expected to be completed in 2015.

In addition to the construction, maintenance, and operation of the highway, the proposed action also includes implementation of the Tier 1 Forest and Wetland Mitigation and Enhancement Plan, as well as specific conservation measures developed jointly by the FHWA, INDOT, and the Service. For complete details of the action, please refer to FWHA's and INDOT's BA developed for the northern long-eared bat, the Service's 2006 Tier 1 RPBO and the various amendments and Tier 2 opinions. Conservation measures incorporating the northern long-eared bat can be found in Appendix A of this opinion.

ACTION AREAS

The Action Area for a project is defined by regulation as all areas to be affected directly or indirectly by the Federal Action and not merely the immediate area involved in the action. This analysis is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. Two seasonal Action Areas have been defined for the proposed endangered northern long-eared bat: (1) the Summer Action Area (SAA) and (2) the Winter Action Area (WAA). Figure 1 shows both the SAA and WAA.

Summer Action Area

The SAA is based on a 1.5 mile buffer on either side of the proposed centerline, along the entire length of the proposed project. Additionally, the SAA has been expanded to include all areas where indirect development is forecasted contiguous with the SAA based on the induced growth expectations in TAZs (Traffic Analysis Zones).

Winter Action Area

The WAA is based on a 5-mile radius buffer around each of the caves where northern long-eared bat presence has been established through either I-69 specific cave studies or Service presence data. The 5-mile radius areas for each of 55 caves were combined together to form an overall WAA. Additionally, the WAA has been expanded to include all areas where indirect development is forecasted contiguous with the WAA based on the induced growth expectations in TAZs (Traffic Analysis Zones).

Analytical Framework for Jeopardy Determinations

In accordance with policy and regulation, the jeopardy analysis in this Conference Opinion relies on four components: (1) the Status of the Species, which evaluates the NLEB range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which evaluates the condition of the NLEB in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the NLEB; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the NLEB; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the NLEB. In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the NLEB's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the NLEB in the wild. The jeopardy analysis in this Conference Opinion places an emphasis on consideration of the range-wide survival and recovery needs of the NLEB and the role of the action area in the survival and recovery of the NLEB as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

STATUS OF THE SPECIES/CRITICAL HABITAT

Northern Long-eared Bat (*Myotis septentrionalis*)

The northern long-eared bat was proposed for listing as endangered under the Endangered Species Act on October 2, 2013 (78 Federal Register 61045). At this time no critical habitat has been proposed for the northern long-eared bat.

The northern long-eared bat (*Myotis septentrionalis*) belongs to the order Chiroptera, suborder Microchiroptera, family Vespertilionidae, subfamily Vesperitilionae, genus Myotis, subgenus Myotis (Caceres and Barclay 2000). The northern long-eared bat was considered a subspecies of Keen's long-eared *Myotis* (*Myotis keenii)* (Fitch and Schump 1979), but was recognized as a distinct species by van Zyll de Jong (1979) based on geographic separation and difference in morphology (*in* Caceres and Pybus 1997; Caceres and Barclay 2000; Nagorsen and Brigham 1993; Whitaker and Hamilton 1998; Whitaker and Mumford 2009; Simmons 2005).

A medium sized bat species, the northern long-eared bat adult body weight averages five to eight grams (0.2 to 0.3 ounces), with females tending to be slightly larger than males (Caceres and Pybus 1997). Average body length ranges from 77 to 95 mm (3.0 to 3.7 in), tail length between

Figure 1. Northern Long-eared Bat Summer and Winter Action Areas.

35 and 42 mm (1.3 to 1.6 in), forearm length between 34 and 38 mm (1.3 to 1.5 in), and wingspread between 228 and 258 mm (8.9 to 10.2 in) (Caceres and Barclay 2000; Barbour and Davis 1969). Pelage (fur) colors include medium to dark brown on its back, dark brown, but not black, ears and wing membranes, and tawny to pale-brown fur on the ventral side (Nagorsen and Brigham 1993; Whitaker and Mumford 2009). As indicated by its common name, the northern long-eared bat is distinguished from other *Myotis* species by its long ears (average 17 mm (0.7 in); Whitaker and Mumford 2009) that, when laid forward, extend beyond the nose but less than five mm (0.2 in) beyond the muzzle (Caceres and Barclay 2000). The tragus (projection of skin in front of the external ear) is long (average 9 mm (0.4 in); Whitaker and Mumford 2009), pointed, and symmetrical (Nagorsen and Brigham 1993; Whitaker and Mumford 2009).

Status and Distribution

The northern long-eared bat ranges across much of the eastern and north-central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993; Caceres and Pybus 1997; Environment Yukon, 2011).

In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to the Florida panhandle (Whitaker and Hamilton 1998; Caceres and Barclay 2000; Amelon and Burhans 2006). The species' range includes the following 38 States: Alabama, Arkansas, Connecticut, Delaware, the District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in Canadian Provinces, Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000). However, throughout the majority of the species' range it is patchily distributed, and historically was less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006).

Although they are typically found in low numbers in inconspicuous roosts, most records of northern long-eared bats are from winter hibernacula surveys (Caceres and Pybus 1997) (for more information on use of hibernacula, see Biology below). They are typically found roosting in small crevices or cracks on cave or mine walls or ceilings (Griffin 1940; Barbour and Davis 1969; Caire *et al.* 1979; Van Zyll de Jong 1985; Caceres and Pybus 1997; Whitaker and Mumford 2009).

The U.S. portion of the northern long-eared bat's range can be described in four parts: the eastern population, the southern population, the western population, and the Midwestern population. Historically, the northern long-eared bat was most abundant in the eastern portion of its range (Caceres and Barclay 2000, p. 2). Northern long-eared bats have been consistently caught during summer mist-net surveys and detected during acoustic surveys in eastern populations (Caceres and Barclay 2000, p. 2). The northern long-eared bat is generally less common in the western portion of its range (Amelon and Burhans 2006, p. 71) and is considered common in only small portions (*e.g.,* Black Hills of South Dakota) and uncommon or rare in the western extremes of the range (*e.g.,* Wyoming, Kansas, Nebraska). In the southern portion of its range it is considered less common than in the northern portion (Amelon and Burhans 2006, p. 71). It is more common in states such as Kentucky and Tennessee, and more rare in the southern extremes of the range (*e.g.,* Alabama, Georgia, South Carolina). Finally, in the Midwest portion of its range, the northern long-eared bat is commonly encountered in summer mist-net surveys throughout the majority of the Midwest and is considered fairly common throughout much of the region.

Although it is often encountered in summer surveys, the species is found infrequently and in small numbers in hibernacula surveys throughout most of the Midwest. In Missouri, northern long-eared bats were listed as a state species of conservation concern until 2007, after which it was decided the species was more common than previously thought because they were commonly captured in mist net surveys (Elliot 2013, pers. comm.). Historically, the northern long-eared bat was considered quite common throughout much of Indiana, and was the fourth or fifth most abundant bat species in the State in 2009. The species has been captured in at least 51 counties, is often captured in mist-nets along streams, and is the most common bat taken by trapping at mine entrances (Whitaker and Mumford 2009, pp. 207–208). The abundance of northern long-eared bats appears to vary within Indiana during the summer. For example, during 3 summers (1990– 1992) of mist-netting surveys in the northern half of Indiana, 37 northern long-eared bats were captured at 22 of 127 survey sites, which represented 4 percent of all bats captured (King 1993, p. 10). In contrast, northern long-eared bats were the most commonly captured bat species (38 percent of all bats captured) during three summers (2006– 2008) of mist netting on two State forests in south-central Indiana (Sheets *et al.* 2013, p. 193). Indiana has 25 hibernacula with winter records of one or more northern long-eared bats. However, it is very difficult to find large numbers of individuals in caves and mines during hibernation (Whitaker and Mumford 2009, p. 208). Their tendency to roost in cracks and crevices make detection challenging.

In Michigan, the northern long-eared bat is known from 25 counties and is not commonly encountered in the State except in parts of the northern Lower Peninsula and portions of the Upper Peninsula (Kurta 1982, p. 301; Kurta 2013, pers. comm.). The majority of hibernacula in Michigan are in the far northern and western Upper Peninsula; therefore, there are very few cave-hibernating bats in general in the southern half of the Lower Peninsula during the summer because the distance to hibernacula is too great (Kurta 2013, pers. comm.). It is thought that the few bats that do spend the summer in the southern half of the Lower Peninsula may hibernate in caves or mines in neighboring states, such as Indiana (Kurta 1982, pp. 301–302; Kurta 2013, pers. comm.).

In Wisconsin, the species is reported to be uncommon (Amelon and Burhans 2006, pp. 71–72). ‘‘Although the northern long-eared bat can be found in many parts of Wisconsin, it is clearly not abundant in any one location. The department has determined that the northern long-eared bat is one of the least abundant bats in Wisconsin through cave and mine hibernacula counts, acoustic surveys, mist-netting in summer foraging areas and harp trap captures during the fall swarming period’’ (Redell 2011, pers. comm.).

Northern long-eared bats are regularly caught in mist-net surveys in the Shawnee National Forest in southern Illinois (Kath 2013, pers. comm.).
Further, the average number of northern long-eared bats caught during surveys between 1999 and 2011 at Oakwood Bottoms in the Shawnee National Forest has been fairly consistent (Carter 2012, pers. comm.). In Iowa, there are only summer mist net records for the species; in 2011 there were eight records (including three lactating females) from west-central Iowa (Howell 2011, unpublished data). In Minnesota, one mine in St. Louis County may contain a large number of individuals, possibly over 3,000; however, this is a very rough estimate since the majority of the mine cannot be safely accessed for surveys (Nordquist 2012, pers. comm.). In Ohio, there are three known hibernacula and the largest population in Preble County has had more than 300 bats. In general, northern long-eared bats are also regularly collected as incidental catches in mist-net surveys for Indiana bats in Ohio (Boyer 2012, pers. comm.).

Reasons for Listing

No other threat is as severe and immediate as the disease white-nose syndrome. If this disease had not emerged, it is unlikely the northern long-eared population would be declining so dramatically. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast - an area that includes the core of the northern long-eared bat's range where it was most common before this disease. Numbers have declined by 99 percent in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread within the species' range, it is expected to spread throughout the United States.

Although significant population declines have not been observed due to the sources of mortality listed below, they may now be important factors affecting this bat's ability to persist while experiencing dramatic declines caused by white-nose syndrome.

Impacts to Hibernacula - Gates or other structures to exclude people from caves and mines restrict bat flight and movement and change airflow and internal cave and mine microclimates. A few degrees change can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Bats use up their energy stores when aroused and may not survive the winter or females may not successfully give birth or rear young.

Loss or Degradation of Summer Habitat- Highway and commercial development, surface mining, and wind facility construction permanently remove habitat and are prevalent in many areas of this bat's range. Timber harvest and forest management can remove or alter (improving or degrading) summer roosting and foraging habitat.

Wind Farm Operation- Wind turbines kill bats, including northern long-eared bats, although only a small number have been documented to date. However, there are many wind projects within a large portion of the bat's range and many more are planned.

Life history

Winter habitat - The northern long-eared bat predominantly overwinters in hibernacula that include caves and abandoned mines. Hibernacula used by northern long-eared bat are typically large, with large passages and entrances (Raesly and Gates 1987), relatively constant, cooler temperatures (0 to 9 degrees C (32 to 48 degrees F)) (Raesly and Gates 1987; Caceres and Pybus 1997; Brack 2007), with high humidity and no air currents (Fitch and Shump 1979; Van Zyll de Jong 1985; Raesly and Gates 1987; Caceres and Pybus 1997). The sites favored by northern long-eared bats are often in very high humidity areas, to such a large degree that droplets of water are often observed on their fur (Hitchcock 1949; Barbour and Davis 1969). The northern long-eared bat is typically found roosting in small crevices or cracks in cave or mine walls or ceilings, often with only the nose and ears visible (Griffin 1940; Barbour and Davis 1969; Caire *et al*. 1979; Van Zyll de Jong 1985; Caceres and Pybus 1997; Whitaker and Mumford 2009).

Caire *et al*. (1979) and Whitaker and Mumford (2009) commonly observed individuals exiting caves with mud and clay on their fur, suggesting the bats were roosting in tighter recesses of hibernacula. They are also found hanging in the open, although not as frequently as in cracks and crevices (Barbour and Davis 1969; Whitaker and Mumford 2009). In 1968, Whitaker and Mumford (2009) observed three northern long-eared bats roosting in the hollow core of stalactites in a small cave in Jennings County, Indiana. To a lesser extent, the northern long-eared bat has been found overwintering in other types of habitat that resemble cave or mine hibernacula (*e.g.*, abandoned railroad tunnels and storm sewer drains, wells, aqueducts, etc.) (Goehring 1954; Kurta and Teramino 1994; French 2011, pers. comm.; Griffin 1945).

Summer habitat - During the summer, northern long-eared bats typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags (Sasse and Perkins 1996; Foster and Kurta 1999; Owen *et al*. 2002; Carter and Feldhamer 2005; Perry and Thill 2007; Timpone *et al.* 2010). Male and non-reproductive female summer roost sites also may include cooler locations (*e.g.*, caves and mines) (Barbour and Davis 1969; Amelon and Burhans 2006). The northern long-eared bat also has been observed roosting in colonies in human-made structures (*e.g.*, buildings, barns, a park pavilion, sheds, cabins, under eaves of buildings, behind window shutters, and bat houses) (Mumford and Cope 1964; Barbour and Davis 1969; Cope and Humphrey 1972; Amelon and Burhans 2006; Whitaker and Mumford 2009; Timpone *et al*. 2010; Joe Kath 2013, pers. comm.).

The northern long-eared bat appears to be somewhat opportunistic in tree roost selection, selecting varying roost tree species and types of roosts throughout its range (*e.g.*, black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), silver maple (*Acer saccharinum*), black locust (*Robinia pseudoacacia*), American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), sourwood (*Oxydendrum arboreum*), and shortleaf pine (*Pinus echinata*)) (Mumford and Cope 1964; Clark *et al*. 1987; Sasse and Pekins 1996; Foster and Kurta 1999; Lacki and Schwierjohann 2001; Owen *et al*. 2002; Carter and Feldhamer 2005; Perry and Thill 2007; Timpone *et al*. 2010). The northern long-eared bat most likely is not dependent on a certain species of tree for roosts throughout their range; rather, certain tree species will form suitable cavities or retain bark suitable for their use (Foster and Kurta 1999). Carter and Felhamer (2005) speculated structural complexity of habitat or available roosting resources are more important factors than the actual tree species.

Many studies document the selection of live trees and snags by northern long-eared bats, with a range of 10 to 53 percent selection of live roosts (Sasse and Perkins 1996; Foster and Kurta 1999; Lacki and Schwierjohann 2001; Menzel *et al*. 2002; Carter and Feldhamer 2005; Perry and Thill 2007; Timpone *et al*. 2010). Foster and Kurta (1999) found 53 percent of roosts in Michigan were in living trees, whereas in New Hampshire, 34 percent of roosts were in snags (Sasse and Pekins 1996). The use of live trees versus snags may reflect the availability of such structures in study areas (Perry and Thill 2007) and the flexibility in roost selection when there is a sympatric bat species present (*e.g*., Indiana bat) (Timpone *et al*. 2010). In tree roosts, the northern long-eared bat is typically found beneath loose bark or within cavities and have been found to use both exfoliating bark and crevices to a similar degree for summer roosting habitat (Foster and Kurta 1999; Lacki and Schwierjohann 2001; Menzel *et al*. 2002; Owen *et al*. 2002; Perry and Thill 2007; Timpone *et al*. 2010).

Canopy coverage at northern long-eared bat roosts has ranged from 56 percent in Missouri (Timone *et al*. 2010), 66 percent in Arkansas (Perry and Thill 2007), greater than 75 percent in New Hampshire (Sasse and Pekins 1996), to greater than 84 percent in Kentucky (Lacki and Schwierjohann 2001). Canopy coverage around northern long-eared bat roosts is lower than in available stands (Sasse and Pekins 1996). Females tend to roost in more open areas than males, likely due to the increased solar radiation, which aids pup development (Perry and Thill 2007). Fewer trees surrounding maternity roosts also may benefit juvenile bats learning to fly (Perry and Thill 2007). However, in southern Illinois, the northern long-eared bat was observed roosting in areas with greater canopy cover than in random plots (Carter and Feldhamer 2005). Roosts are also largely selected below the canopy, which could be due to the species' ability to exploit roosts in cluttered environments due to gleaning behavior enabling them to easily maneuver around obstacles (Foster and Kurta 1999; Menzel *et al*. 2002).

Northern long-eared bat females typically roost in tall, large-diameter trees (Sasse and Pekins 1996). The diameter-at-breast height (dbh) and height of northern long-eared bat roost trees is greater than random trees (Lacki and Schwierjohann 2001; Sasse and Pekins 1996; Owen *et al*. 2002). However, other studies have found roost tree mean dbh and height did not differ from random trees (Menzel *et al*. 2002; Carter and Feldhamer 2005). Lacki and Schwierjohann (2001) found northern long-eared bat roosts are located more often on upper and middle slopes than lower slopes, which suggests a preference for higher elevations due to increased solar heating.

Biology

Hibernation - Northern long-eared bats hibernate during the winter months to conserve energy from increased thermoregulatory demands and reduced food resources. In general, northern long-eared bats arrive at hibernacula in August or September, enter hibernation in October and November, and leave the hibernacula in March or April (Caire *et al*. 1979; Whitaker and Hamilton 1998; Amelon and Burhans 2006). Northern long-eared bats have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum (Pearson 1962), although they may not return to the same hibernaculum in successive seasons (Caceres and Barclay 2000).

Typically, the northern long-eared bat is not abundant and comprises a small proportion of the total number of bats hibernating in a hibernaculum (Barbour and Davis 1969; Mills 1971; Caire *et al*. 1979; Caceres and Barclay 2000). Although usually found in small numbers, the species typically inhabits the same hibernacula with large numbers of other bat species, and occasionally are found in clusters with these other bat species. Other species that commonly occupy the same habitat include: little brown bat, big brown bat, eastern small-footed bat, tri-colored bat, and Indiana bat (Swanson and Evans 1936; Griffin 1940; Hitchcock 1949; Stones and Fritz 1969; Fitch and Shump 1979). Whitaker and Mumford (2009), however, infrequently found northern long-eared bats hibernating beside little brown bats, Indiana bats, or tri-colored bats, since they found few hanging on side walls or ceilings of cave passages. Barbour and Davis (1969) found the species is rarely found in concentrations exceeding 100 individuals in a single hibernaculum.

The northern long-eared bat often moves between hibernacula throughout the winter, which may further decrease population estimates (Griffin 1940; Whitaker and Rissler 1992b; Caceres and Barclay 2000). Whitaker and Mumford (2009) found this species flies in and out of some of the mines and caves in southern Indiana throughout the winter. In particular, the bats were active at Cave periodically all winter, with northern long-eared bat being more active than other species (such as little brown bat and tricolored bat) hibernating in the cave. Though northern long-eared bats fly outside of the hibernacula during the winter, they do not feed; hence the function of this behavior is not well understood (Whitaker and Hamilton 1998). However, it has been suggested bat activity during winter could be due in part to disturbance by researchers (Whitaker and Mumford 2009).

The northern long-eared bat exhibits significant weight loss during hibernation. In southern Illinois, northern long-eared bat individuals weighed an average of 6.6 g (0.2 ounces) prior to 10 January compared to an average of 5.3 g (0.2 ounces) after this date (Pearson 1962). Whitaker and Hamilton (1998) report a weight loss of 41 – 43 percent over the hibernation period for northern long-eared bats in Indiana. In eastern Missouri, male northern long-eared bats lost an average of 3 g (0.1 ounces) during the hibernation period (late October through March), and females lost an average of 2.7 g (0.1 ounces) (Caire *et al*. 1979).

Migration and homing - While the northern long-eared bat is not considered a long-distance migratory species, short migratory movements (56 km (35 mi) to 89 km (55 mi)) occur between summer roost and winter hibernacula (Nagorsen and Brigham 1993; Griffith 1945). However, movements from hibernacula to summer colonies may range from 8 to 270 km (5 to 168 mi) (Griffin 1945). Several studies show a strong homing ability of northern long-eared bat in terms of return rates to a specific hibernaculum, although bats may not return to the same hibernaculum in successive winters (Caceres and Barclay 2000). Banding studies in Ohio, Missouri, and Connecticut show return rates to hibernacula of 5.0 percent (Mills 1971), 4.6 percent (Caire *et al*. 1979), and 36 percent (Griffin 1940), respectively. An experiment with a (intentionally) blinded bat showed the individual returned to its home cave up to 32 km (20 mi) away after being removed 3 days prior (Stones and Branick 1969). Individuals have been known to travel between 56 and 97 km (35 and 60 mi) between caves during the spring (Caire *et al*. 1979; Griffin 1945).

Summer roosts - Northern long-eared bats switch roosts often (Sasse and Perkins 1996), typically every two – three days (Foster and Kurta 1999; Owen *et al*. 2002; Carter and Feldhamer 2005; Timpone *et al*. 2010). In Missouri, the longest time spent roosting in one tree was three nights. However, a maximum of 11 nights spent roosting in a human-made structure has been documented (Timpone *et al*. 2010). Bats switch roosts for a variety of reasons, including, temperature, precipitation, predation, parasitism, and ephemeral roost sites (Carter and Feldhamer 2005). Ephemeral roost sites, with the need to proactively investigate new potential roost trees prior to their current roost tree becoming uninhabitable (*e.g*., tree falls over), may be the most likely scenario (Kurta *et al*. 2002; Carter and Feldhamer 2005; Timpone *et al*. 2010). In Missouri, Timpone *et al*. (2010) radio-tracked 13 northern long-eared bats to 39 roosts and found the mean distance between the location where captured and roost tree was 1.7 km (1.1 mi) (range 0.07–4.8 km (0.04–3.0 mi), and the mean distance traveled between roost trees was 0.67 km (0.42 mi) (range 0.05–3.9 km (0.03–2.4 mi)). In the Ouachita Mountains of Arkansas, Perry and Thill (2007) found individuals moved among snags that were within a 2 ha (5 ac) area.

Some studies have found tree roost selection to differ slightly between males and females. Northern long-eared bat males have been found to more readily use smaller diameter trees for roosting than females, suggesting males are more flexible in roost selection than females (Lacki and Schwierjohann 2001; Perry and Thill 2007). In the Ouachita Mountains of Arkansas, both sexes primarily roosted in snags, although females roosted in snags surrounded by fewer midstory trees than did males (Perry and Thill 2007). In northeastern Kentucky, males do not use colony roosting sites and are typically found occupying cavities in live hardwood trees, while females form colonies more often in both hardwood and softwood snags (Lacki and Schwierjohann 2001).

The northern long-eared bat is comparable to the Indiana bat in terms of summer roost selection, but appears to be more opportunistic (Carter and Feldhamer 2005; Timpone *et al*. 2010). In southern Michigan, northern long-eared bat used cavities within roost trees, living trees, and roosts with greater canopy cover more often than does the Indiana bat, which occurred in the same area (Foster and Kurta 1999). Similarly, in northeastern Missouri, Indiana bats typically roosted in snags with exfoliating bark and low canopy cover, whereas northern long-eared bat used the same habitat in addition to live trees, shorter trees, and trees with higher canopy cover (Timpone *et al*. 2010). Although northern long-eared bats are more opportunistic than Indiana bats, there may be a small amount of roost selection overlap between the two species (Foster and Kurta 1999; Timpone *et al*. 2010).

Reproduction - Breeding occurs from late July in northern regions to early October in southern regions and commences when males begin to swarm hibernacula and initiate copulation activity (Whitaker and Hamilton 1998; Whitaker and Mumford 2009; Caceres and Barclay 2000; Amelon and Burhans 2006). Copulation occasionally occurs again in the spring (Racey 1982).

Hibernating females store sperm until spring, exhibiting a delayed fertilization strategy (Racey 1979; Caceres and Pybus 1997). Ovulation takes place at the time of emergence from the hibernaculum, followed by fertilization of a single egg, resulting in a single embryo (Cope and Humphrey 1972; Caceres and Pybus 1997; Caceres and Barclay 2000); gestation is approximately 60 days (Kurta 1994). Males are reproductively inactive until late July, with testes descending in most males during August and September (Caire *et al*. 1979; Amelon and Burhans 2006).

Maternity colonies, consisting of females and young, are generally small, numbering from 30 to 60 individuals (Whitaker and Mumford 2009; Caceres and Barclay 2000). However, one group of 100 adult females was observed in Vermilion County, Indiana (Whitaker and Mumford 2009). In West Virginia, maternity colonies in two studies had a range of 7–88 individuals and 11–65 individuals, with a mean size of 31 (Owen *et al*. 2002; Menzel *et al*. 2002). Lacki and Schwierjohann (2001) found population size of colony roosts declined as summer progressed with pregnant females using the largest colonies (mean=26) and post-lactating females using the smallest colonies (mean=4), with the largest overall reported colony size of 65 bats. Other studies also found number of individuals within a maternity colony typically decreases from pregnancy to postlactation (Foster and Kurta 1999; Lacki and Schwierjohann 2001; Garroway and Broders 2007; Perry and Thill 2007; Johnson *et al*. 2012). Female roost site selection, in terms of canopy cover and tree height, changes depending on reproductive stage; relative to pre- and post-lactation periods, lactating northern long-eared bats have been shown to roost higher in tall trees situated in areas of relatively less canopy cover and tree density (Garroway and Broders 2008).

Adult females give birth to a single pup (Barbour and Davis 1969). Birthing within the colony tends to be synchronous, with the majority of births occurring around the same time (Krochmal and Sparks 2007). Parturition (birth) likely occurs in late May or early June (Caire *et al*. 1979; Easterla 1968; Whitaker and Mumford 2009), but may occur as late as July (Whitaker and Mumford 2009). Broders *et al*. (2006) estimated a parturition date of July 20 in New Brunswick. Lactating and post-lactating females were observed in mid-June in Missouri (Caire *et al*. 1979), July in New Hampshire and Indiana (Sasse and Pekins 1996; Whitaker and Mumford 2009), and August in Nebraska (Benedict 2004). Juvenile volancy (flight) occurs by 21 days after parturition (Krochmal and Sparks 2007; Kunz 1971) and as early as 18 days after parturition (Krochmal and Sparks 2007). Subadults were captured in late June in Missouri (Caire *et al*. 1979), early July in Iowa (Sasse and Pekins 1996), and early August in Ohio (Mills 1971). Adult longevity is estimated to be up to 19 years (Hall 1957; Kurta 1995). Most mortality for northern long-eared bat occurs during the juvenile stage (Caceres and Pybus 1997).

Foraging behavior and home range - The northern long-eared bat has a diverse diet including moths, flies, leafhoppers, caddisflies, and beetles (Nagorsen and Brigham 1993; Brack and

Whitaker 2001; Griffith and Gates 1985), with diet composition differing geographically and seasonally (Brack and Whitaker 2001). Feldhamer *et al*. (2009) noted close similarities of all *Myotis* diets in southern Illinois. Griffith and Gates (1985) found significant differences in the diets of northern long-eared bat and little brown bat. The most common insects found in the diets of northern long-eared bat are lepidopterans (moths) and coleopterans (beetles) (Feldhamer *et al*. 2009; Brack and Whitaker 2001) with arachnids (spiders) also being a common prey item (Feldhamer *et al*. 2009). Foraging techniques include hawking and gleaning, in conjunction with passive acoustic cues (Nagorsen and Brigham 1993; Ratcliffe and Dawson 2003). Hawking is aerial foraging; catching insects in flight through the use of echolocation. The northern long-eared bat has the highest frequency call of any bat species in the Great Lakes area (Kurta 1995). Observations of northern long-eared bat foraging on arachnids (Feldhamer *et al*. 2009), presence of green plant material in their feces (Griffith and Gates 1985), and non-flying prey in their stomach contents (Brack and Whitaker 2001) suggest considerable gleaning behavior. Gleaning allows this species to gain a foraging advantage for preying upon moths because moths are less able to detect these high frequency echolocation calls (Faure *et al*. 1993). Emerging at dusk, most hunting occurs above the understory, 1 to 3 m (3 to 10 ft) above the ground, but under the canopy (Nagorsen and Brigham 1993) on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001; LaVal *et al*. 1977). This coincides with data indicating mature forests are an important habitat type (Caceres and Pybus 1998). Occasional foraging also takes place over forest clearings and water and along roads (Van Zyll de Jong 1985). Foraging patterns indicate a peak activity period within five hours after sunset followed by a secondary peak within eight hours after sunset (Kunz 1973). Brack and Whitaker (2001) did not find significant differences in the overall diet between morning (3 a.m. to dawn) and evening (dusk to midnight) feedings. However there were some differences in the consumption of particular prey orders between morning and evening feedings. Additionally, no significant differences existed in dietary diversity values between age classes or sex groups (Brack and Whitaker 2001).

Female home range size may range from 19 to 172 ha (47–425 acres) (Lacki *et al*. 2009). Owen *et al*. (2003) estimated average maternal home range size to be 65 ha (161 ac). Home range size of northern long-eared bat in this study site was small relative to other bat species, but this may be due to the studies timing (during the maternity period) and the small body size of northern long-eared bat (Owen *et al*. 2003). The mean distance between roost trees and foraging areas of radio-tagged individuals in New Hampshire was 620 m (2034 ft) (Sasse and Pekins 1996).

Recovery and Management

The most important recovery action for the northern long-eared bat is to stop or slow the spread of white-nose syndrome (WNS). WNS is a disease responsible for unprecedented mortality in hibernating bats in the northeast, and continues to spread throughout the range of the northern long-eared bat. Although conservation efforts have been undertaken to help reduce the spread of the disease through human-aided transmission, these efforts have only been in place for a few years and it is too early to determine how effective they are in decreasing the rate of spread.

Previous Incidental Take Authorizations

Because the northern long-eared bat is not yet federally listed, no Incidental Take Authorizations have been implemented to date. Several conferences related to the northern long-eared bat have or are currently taking place. Last December (2013), a conference opinion was developed for the Ouachita National Forest in Arkansas. This project anticipates removing six acres of wooded northern long-eared bat habitat within the new construction footprint of roads and trails associated with the .

Another conference opinion was developed at part of the section 7 consultation for the transportation improvement project in Centre County, Pennsylvania. Impacts to northern long-eared bats included the loss of up to 57 acres of forested habitat and some “slight, but unquantifiable” amount of take due to roadkill.

In the Midwest, rapid wind development is a concern for bats. Due to the known adverse effects from wind energy development, the Service, State natural resource agencies, and wind energy industry representatives are developing the Midwest Wind Energy Multi-Species Habitat Conservation Plan (MSHCP). The planning area includes the Midwest Region of the Service, which includes all or portions of the following States: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The MSHCP would allow permit holders to proceed with wind energy development, which may result in "incidental" taking of a listed species under section 10 of the Act, through issuance of an incidental take permit (77 FR 52754). The northern long-eared bat is a covered species under the MSHCP. The MSHCP will address protection of covered species through avoidance, minimization of take, and mitigation to offset take (*e.g.*, habitat preservation, habitat restoration, habitat enhancement) and help ameliorate the adverse effects of wind development (77 FR 52754).

In certain cases, the U.S. Forest Service has agreed to limit or restrict burning in the central hardwoods from mid- to late April through summer to avoid periods when bats are active in forests (Dickinson *et al*. 2010).

ENVIRONMENTAL BASELINE

This section is an analysis of the past effects of State, tribal, local and private actions already affecting the species within the Action Areas and the present effects within the Action Areas that will occur contemporaneously with the consultation in progress. It includes a description of the known status of northern long-eared bats and their habitats within or near the I-69 Action Areas.

The natural environments traversed by the project are summarized within the Tier 1 RPBO (pgs. 59-67), along with the I-69, Evansville to Indianapolis, Indiana Tier 1 FEIS and are hereby incorporated by reference.

Northern Long-eared bats in the Action Area

From 2004 through to 2014, various seasonal field investigations have been conducted to determine bat use of summer habitat resources throughout the I-69 corridor. From 2004 to the present, data from the surveys have included all species of bats; however, because the northern long-eared bat was not listed as endangered during this time period, only capture data is available (i.e., radio-telemetry resulting in the identification of northern long-eared bat roost sites was not conducted). Below is a summary of the data that FHWA and INDOT, along with their consultants, have collected over the past decade.

Bridge and Culvert Surveys

In 2004 and 2005, approximately 259 bridges and culverts were inspected for bats in spring and summer. Eight of these structures were found to support bats. Table 1 shows the results for bats found under bridges in the SAA. located in the upper part of Section 6; are located north of Bloomington in Section 5; and the are located in the upper middle part of Section 4. Sections 1, 2 and 3 did not have any bridges with bats, except for Formal studies were completed on this bridge from 2006 to 2011.

Table 1. Bats found under eight existing bridges in the I-69 study area from 2004-11.

	Bridge over Creek		MYSO	MYGR	MYSE	MYLU	EPFU	PESU	Unk	Total
Sec 6		2004					20			20
							8			8
Sec 5		2004			2	2		6	3	13
								1		1
Sec 4		2004					2			2
					2					2
									1	1
Sec 3		2004	3			5		14		22
		2005	9			485	7			501
		2006-2011	878	2		6887	774	29		8,570
	Total		**890**	**2**	**4**	**7379**	**811**	**50**	**4**	**9,140**

Shaded species are federally listed or proposed listed species.

This bridge had, by far, the most bat use of any bridge in the study area. One-hundred twenty-one visits to this bridge from 2004 to 2011 yielded approximately 9,093 bats from 5 species. They were 7,377 little brown (MYLU), 890 Indiana (MYSO), 781 big brown (EPFU), 43 tri-colored (PESU) and 2 gray bats (MYGR). The Indiana bat and gray bat are federally listed species. This bridge did not show any northern long-eared bats (MYSE) even though they are very common in the area.

Of the 259 bridges and culverts investigated for bats in 2004 and 2005, only 2 bridges supported northern long-eared bats. There were 2 northern long-eared bats under the (Section 5) and 2 found under the (Section 4).

Mist Netting

Table 2 shows a summary of the bat surveys for I-69 in terms of Relative Abundance, Frequency of Occurrence and Captures per Net Night that include all species, including the northern long-eared bat. Collectively, 4,119 bats from 9 species were captured from 2004 to 2014 (9 years of survey). These included red bat (n=1,072, 26%), big brown bat (n= 834, 20%), little brown bat (n=703, 17%), tri-colored bat (n=630, 15%), evening bat (n=364, 9%), northern long-eared bat (n=339, 8%), Indiana bat (n=112 , 3%), hoary bat (n=31, 1%), and silver-haired bat (n=16, <1%) bats. Eighteen bats are unknowns since they escaped from the net before identification.

Table 2. Relative Abundance, Frequency of Occurrence and Captures Per Net Night.

Species	Relative Abundance										
Year Sections	**2004** 1 2 3 4 5 6	**2005** 1 2 3 4 5 6	**2008** 1	**2009** 1	**2010** 1 2 3 4	**2011** 1 2 3 4	**2012** 1 2 3 4 5	**2013** 1 2 3 4	**2014** 1 2 3 4 5	**Total**	**% of Total**
Lasiurus borealis	327	74	27	6	125	85	235	81	112	1072	26%
Eptesicus fuscus	266	49	12	2	80	69	194	54	108	834	20%
Myotis lucifugus	259	44			138	121	121	19	1	703	17%
Perimyotis subflavus	219	49	32	10	64	91	108	43	14	630	15%
Myotis septentrionalis	145	47	1		29	34	75	6	2	339	8%
Nycticeius humeralis	105	28	10	7	51	40	40	32	51	364	9%
Myotis sodalis	49	7	3	1	7	8	21	6	10	112	3%
Lasiurus cinereus	7	2			1	1	9	3	8	31	< 1%
Lasionycteris noctivagans					1		7	1	7	16	< 1%
Unknown	1	2				1	5	6	3	18	< 1%
Total	1378	302	85	26	496	450	815	251	315	4119	100%
Diversity ($D=1/\Sigma P_i^2$)	5.80	5.98	3.60	3.56	5.06	5.37	5.23	4.91	3.62		

Table 2. Relative Abundance, Frequency of Occurrence and Captures Per Net Night.										
Survey Data	**Frequency of Occurrence**									
	2004	**2005**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
# of Sites Sampled	149	44	5	4	27	23	57	33	41	383
# of Sites with *Myotis sodalis*	31	6	2	1	6	6	9	5	8	45
# of Sites with *Myotis septentrionalis*	62	22	1	0	10	15	27	4	2	102
# of Sites with *Myotis sodalis* and *Myotis septentrionalis*	18	4	0	0	2	3	4	0	0	39
% of *Myotis sodalis* Sites with *Myotis septentrionalis*	58%	67%	0%	0%	33%	50%	44%	0%	0%	87%
% of *Myotis septentrionalis* Sites with *Myotis sodalis*	29%	18%	0%	0%	20%	20%	15%	0%	0%	38%
Species	**Captures Per Net Night**									
	2004	**2005**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean ± 1 SD***
Lasiurus borealis	0.55	0.60	1.04	0.33	1.14	0.87	0.88	0.60	0.58	0.73 ± 0.25
Eptesicus fuscus	0.45	0.40	0.46	0.11	0.73	0.70	0.72	0.40	0.56	0.50 ± 0.19
Myotis lucifugus	0.43	0.36	0.00	0.00	1.25	1.23	0.45	0.14	0.01	0.43 ± 0.47
Perimyotis subflavus	0.37	0.40	1.23	0.56	0.58	0.93	0.40	0.32	0.07	0.54 ± 0.33
Myotis septentrionalis	0.24	0.38	0.04	0.00	0.26	0.35	0.28	0.04	0.01	0.18 ± 0.15
Nycticeius humeralis	0.18	0.23	0.38	0.39	0.46	0.41	0.15	0.24	0.26	0.30 ± 0.11
Myotis sodalis	0.08	0.06	0.12	0.06	0.06	0.08	0.08	0.04	0.05	0.07 ± 0.02
Lasiurus cinereus	0.01	0.02	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.02 ± 0.01
Lasionycteris noctivagans	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.04	0.04	0.01 ± 0.01
Unknown	0.00	0.02	0.00	0.00	0.00	0.01	0.02	0.04	0.02	0.01
Total Net Nights	597	123	26	18	110	98	268	134	194	**1,374**
Yearly captures per net night	2.31	2.46	3.27	1.44	4.51	4.59	3.04	1.87	1.62	2.79 ± 1.10

*SD refers to Standard Deviation

Species diversity was relatively consistent for 2004, 2005, 2010, 2011, 2012, and 2013 (Range = 5 to 6), with the exception of 2008, 2009 and 2014 (each about 3.6). During 2008 and 2009, only Section 1 was sampled, and no little brown and only one northern long-eared bat were captured. Lack of preferred habitat in Section 1 for these two species may account for differences.

From 1,548 net nights of effort, 163 female and 169 male northern long-eared bats (seven of unknown gender) were captured. Of the 189 sites sampled, 69 showed northern long-eared bats (36%). Northern long-eared bats were captured at 87% of the sites where Indiana bats were captured. By comparison, Indiana bats were captured at 38% of the sites where northern long-eared bats were captured. This difference in percentages is attributable to three times more northern long-eared bats than Indiana bats (339 to 112) over the nine year data period, and the more general geographic distribution of the northern long-eared bat.

However, it is not uncommon to have these two species both present at individual survey sites since they share similar habitat and habits. Refer to the similar summer habitat for these two species reported in Appendix A of the Service's "Northern Long-Eared Bat Interim Conference and Planning Guidance" (Regions 2, 3, 4, 5 and 6) dated January 6, 2014.

Captures per net night showed variability throughout each species and between years. Comparing 2004 (which had the greatest number of survey sites and net nights) with 2012- 2014 (which is after White Nose Syndrome was reported in Indiana on February 1, 2011), it would appear that population trends of the red bat, big brown bat, tri-colored bat and evening bat are reasonably constant. However, populations trends for the little brown bat, northern long-eared bat and Indiana bat (the myotid species) are questionable.

Radio-telemetry and Roost Tree Identification

Radio-telemetry studies for the northern long-eared bat were not conducted in the past because it was not a listed species during prior studies. In 2014, INDOT and FHWA monitored eight mist netting sites in Section 5 in areas where clearing and construction had not yet occurred; telemetry was proposed for any northern long-eared bats caught in this portion of the project area. Only 2 male northern long-eared bats were captured in Section 5. Protocol did not warrant placing a radio-transmitter on these 2 males because the protocol directs that males captured the first night at a site would not be fitted with a radio-transmitter so as to save the transmitters for females. If no females are captured on the first night for a site, then males captured on the second night could be transmitted provided a female was not captured earlier that same night. No female northern long-eared bats were identified in the mist netting survey in Section 5. For this reason, no roost data is available.

During 2014 surveys of Sections 1, 2, 3 and 4, no northern long-eared bats were captured.

FHWA/INDOT capture data for 337 northern long-eared bats from 2004-2013 and two northern long-eared bats in Section 5 for 2014 are provided in Table 11 of the NLEB BA. FHWA and INDOT will not need to complete any radio-telemetry studies in Sections 1-3 (since it has been constructed), nor in Section 4 (since it has had tree clearing completed). FHWA and INDOT are required to complete future radio-telemetry studies and emergence counts in Sections 5 and 6 on the northern long-eared bat (along with the Indiana bat) following the Service's established methodology.

Maternity Colonies

Maternity colonies were identified by the Service's Bloomington Field Office (BFO) using the best information available (primarily FHWA and INDOT summer mist net survey data for the I-69 project). The maternity colony analysis considered: (a) Capture sites for the northern long-eared bat from 2004 to present, especially for reproductive females and juveniles; (b) Habitat evaluations that follow preferred habitat documented by for the northern long-eared bats, (c) Other data from nearby studies, and (d) Maps (e.g., aerials, GIS, Service generated, and others).

A maternity colony typically consists of reproductively active female northern long-eared bats and their young (i.e., typically 1 pup/adult female/year). A maternity colony was determined to exist if there was evidence of reproduction in an area during the summer reproductive season (the capture of a reproductive female or juvenile). Since no telemetry studies have been done for the northern long-eared bat in the Action Area, no roost trees have been identified. Each maternity colony's roosting and foraging area was assumed to fall within a circle with a 1.5-mile radius centered on mist net sites of northern long-eared bat captures. These colonies were developed independently of any Indiana bat maternity colonies. There are 38 northern long-eared bat maternity colonies identified along I-69 by the Service. Section 1 has 2 maternity colonies; Section 2 has 6 maternity colonies; Section 3 has 8 maternity colonies; Section 4 has 9 maternity colonies; Section 5 has 9 maternity colonies; and Section 6 has 4 maternity colonies:

<u>Section 1</u>- Pigeon Creek South, Pigeon Creek North
<u>Section 2</u> - Robinson South, Patoka South Fork, Robinson North, Flat Creek, East Fork White River, Aikman Creek
<u>Section 3</u> – Thousand Acre Wood, North Fork Prairie Creek, Smother Creek, White River - Weaver Ditch, White River - Fourmile Creek, First Creek West, First Creek East, Doan's Creek West
<u>Section 4</u> - Bogard Creek, Doan's Creek East, Black Ankle Creek, Plummer Creek, Mitchell Branch, Little Indian Creek Monroe, Indian Creek South, Indian Creek West, Indian Creek North
<u>Section 5</u> - Beanblossom East, Beanblossom West, Indian Creek Morgan, Bryant Creek South, Little Indian Monroe, Bryant Creek North, Jordan Creek, Little Indian Creek Morgan, Lambs Creek
<u>Section 6</u> – Clear Creek East Fork, White River, White River – Goose Creek, Pleasant Run

Detailed information for each maternity colony, including the number of northern long-eared bats captured, number of over-lapping Indiana bat colonies, amount of secured mitigation sites located within or near the colonies, amount of forest and wetland habitat per colony, etc. can be found in the NLEB BA and its appendices and is hereby incorporated by reference.

Because the northern long-eared bat is not yet a listed species, no radio-telemetry studies for this species have been conducted to date by FHWA or INDOT for the I-69 project. Future surveys in Section 5 and Section 6 will include telemetry for northern long-eared bats as part of the bat survey and monitoring practices, however, even with that effort, it would be practically impossible to determine the number of colony members for each of the individual maternity colonies. Based on this, and northern long-eared bat literature, the Service has decided to conservatively assume that each maternity colony is comprised of 50 adult females and their single offspring. This would result in a maximum of 100 bats per colony by mid- June when the young are born and when they become volant (i.e., capable of flight) around mid-July. The Service believes a 50-adult female colony size is a reasonable assumption based on the information presented in the Services's Northern Long-eared Bat Interim Conference and Planning Guidance and other studies (Arnold, 2007; Caeceres and Barclay, 2000; Johnson et. al. 2011). To be conservative towards the bats, we are assuming that 100% of adult females will successfully bear a live pup and that 100% of the pups will survive to volancy, which is probably higher than reality, but gives the benefit-of-the doubt to the species. The actual reproductive rate of adult females in each maternity colony is unknown as is the current mortality rate of adults and juveniles.

Given the estimated presence of 38 maternity colonies in the SAA and an approximate total of 100 females and their pups per colony, then we can assume that there are a combined total of approximately 3,800 (38 x 100 = 3,800) adult females (n=1,900) and juveniles (n=1,900) within or adjacent to the defined SAA and that variable proportions of the bats in these colonies are likely to be exposed to direct and/or indirect effects from I-69. In this situation, since all of the direct habitat impacts in Sections 1-4 (and the southern portion of Section 5) have already occurred, we estimate that only 13 northern long-eared colonies would incur direct habitat loss as a result of the project.

Adult Males

From 1,548 net nights of effort (2004-2014), 169 male northern long-eared bats were captured in the action area.

Fall/Winter/Spring Cave Surveys

In 2004, INDOT and FHWA developed a database of 330 caves along with 41 new caves and 2 railroad tunnels located within 5 miles of the I-69 corridor. This list was developed with the help of the Indiana Cave Survey, Indiana Karst Conservancy, Indiana Geological Survey, Service and expert bat biologists familiar with the bat biology in southwestern Indiana. These caves were reviewed by the Service, biologists and bat/cave professionals for potential bat survey locations in the I-69 project area.

Two hundred and fifty (250) caves were selected for further field investigation based on their potential as bat hibernacula. Criteria used were: (1) a chimney air flow effect; (2) multiple cave openings; (3) a large volume that stores cool air; (4) constant winter air temperatures from 3° to 6° C; (5) previous records of bats in the database; and (6) the size and diversity needed as a hibernacula.

Based on field reviews of these 250 caves, INDOT and FHWA contracted to have 76 caves surveyed for Indiana bats in the fall, winter and spring of 2004-05 and 2005-06 (Figure 2). The surveys included either harp trapping the entrance of the cave in the fall or spring, and/or completing a winter census (*i.e.*, an internal count of bats in the cave), and included species identification. Of the 76 caves, eleven did not show any bats of any species from the two winter censuses or any of the fall/spring harp trapping. Of the 65 caves where bats were noted/captured, northern long-eared bats were found in 50 (75%). Two-hundred and seventy-eight of a total 1,030 northern long-eared bats were from Popcorn Spring Cave. Table 3 provides northern long-eared bat harp trapping capture data and winter cave survey data.

In the winter of 2004-05 and 2005-06, a collective census (internal survey) of 73 caves was conducted to determine the species and number of bats utilizing these resources as hibernacula. A total of 3,117 bats representing five species were documented from this effort; northern long-eared bats were observed in eight caves during the winter surveys.

In addition, northern long-eared bats were harp trapped at 49 cave entrances. In the fall of 2004 and 2005 and the spring of 2005, the entrances to 74 caves in Greene, Monroe and Lawrence counties were harp trapped to assess bat usage. Two of the total 76 caves ( ) were not surveyed via harp trap. Fifty-nine caves were harp-trap surveyed in the fall of 2004 resulting in 1,800 bats; 9 caves were surveyed in the spring of 2005 resulting in 330 bats; and 16 caves were surveyed in the fall of 2005 resulting in 468 bats for a total of 2,598 bats.

Species found were the northern long-eared bat (n=1,015), little brown bat (n=955), tri-colored bat (n=607), Indiana bat (n=21) and big brown bat (n=5). Table 3 provides harp trap capture data for the northern long-eared bats at entrances. Northern long-eared bats were captured at 49 caves. Of the 5 species harp trapped at the entrance to the caves, the northern long-eared bat showed the greatest number. All efforts will be made to protect the water quality and integrity of these caves using the Karst MOU dated October 13, 1993.

Data from Local Mines

INDOT and FHWA investigated the use of mines within 5 miles of the I-69 project for Indiana bats and northern long-eared bats. They coordinated with the IDNR Division of Reclamation to obtain GIS data on mines that have had bat gates installed based on their bat occupancy data.

From the GIS data provided, they were able to identify four locations (some locations have more than one mine entrance) that occur within 5 miles of the I-69 right-of-way, all of which were in County.

The data included records of northern long-eared bats at two of the mines, one associated with the Patoka River watershed and one associated with the East Fork White River. The East Fork White River also had records for the Indiana bat. The period of record for this data is 1996 to 1998, and included data from May, June, August, September and early October. There were no other data available. The individuals from the Patoka River mine were all male northern long-eared bats. Both males and females were captured during the September sampling at the East Fork White River site in 1998.

The IDNR Division of Reclamation indicated that their survey efforts no longer include attempts to determine species. Their surveys now focus on a bat presence/absence to determine if gates are warranted. Appendix A of the NLEB BA includes IDNR's data received from the Agency Coordination

Figure 2 has been removed in its entirety to maintain the confidentiality of the endangered species data contained within.

Figure 2. Winter Action Area and Northern Long-eared bat Hibernacula.

Table 3. Summary of Cave Data for the Northern Long-eared Bat						
Cave	2004 Fall Harptrap	2005 Winter Census	2005 Spring Harptrap	2005 Fall Harptrap	2006 Winter Census	Cave Totals
	0	0	0	21	0	21
	3	0	0			3
	13	0				13
	78	0				78
	1	0				1
	10	0				10
	1	0				1
				1	0	1
				3	0	3
	3	0				3
	4	0				4
				8	0	8
	45	0				45
	27	0				27
	4	0				4
				9	0	9
				4	0	4
	23	0				23
	1	0				1
				4	0	4
	3	0				3
	3	0				3
	8	0				8
	0	0	3			3
				2	1	3
	2	0				2
	0	0	1			1
	55	0				55
				49	0	49
				61	0	61
	88	1	189			278
	3	0				3
	8	1				9
	1	1				2
	4	0				4

Table 3. Summary of Cave Data for the Northern Long-eared Bat

Cave	2004 Fall Harptrap	2005 Winter Census	2005 Spring Harptrap	2005 Fall Harptrap	2006 Winter Census	Cave Totals
	0	0				0
				17	0	17
	2					2
	14		8			22
	45	0				45
	41	1		36	0	78
	5	0				5
	4	8				12
	9	0				9
		1				1
	11	0				11
				25	0	25
				16	0	16
	1	1				2
	35					35
	3	0				3
Total	558	14	201	256	1	1030

Shading indicates no sampling occurred.

The bulk of these data consists of males using these features in summer. It is not atypical for males to use caves or mines in summer. Finding males and non-reproductive females at the mine in the East Fork White River watershed in September is also expected. From the Federal Register, Volume 78, No. 191 under the Summer Section (page 61054), “males and non-reproductive females’ summer roost sites may also include cooler locations, including caves and mines” (Barbour and Davis, 1969, p. 77; Amelon and Burhans 2006, p. 72).

Baseline for the SAA, WAA and Maternity Colonies

The direct habitat loss analysis will evaluate the remaining SAA (SAA minus the colony areas), the WAA, and the 13 maternity colonies that are located in the northern portion of the project where tree clearing has not yet occurred. Indirect and cumulative impacts will be evaluated for all 38 maternity colonies, as well as the entire remaining SAA and WAA. According to the NLEB BA, the entire remaining SAA is comprised of 436,284 acres of which 119,219 acres or 27% is forested. The WAA being considered consists of 333,185 total acres of which 207,543 or 62% is forested. Finally, total forest cover within each maternity colony (which contains 4,524 acres) ranged from 313 acres (7% of the colony area) for the Smothers Creek colony in Section 3 to 4,005 acres (89% of the total area) for the Little Indian Monroe colony in Section 4. The current or baseline acreages and conditions of each maternity colony, hibernacula foraging area, and project section is detailed in Tables 17-24 of the NLEB BA and is incorporated by reference. Additional information can also be found in Appendix E and F of the NLEB BA.

Ongoing Stressors in the Action Areas

As was the case for the Indiana bat, the Service believes the following State, local, and private actions are currently occurring within the action areas and are likely to be adversely affecting some percentage of northern long-eared bats to variable degrees, and are likely to continue into the reasonably foreseeable future.

- Loss and degradation of roosting and foraging habitat – variable amounts of private and public, commercial and residential developments are converting, fragmenting, or otherwise degrading forest habitat available for roosting and foraging, especially near larger urban centers and along primary and heavily traveled secondary roadways and their main intersections. Most of the forest within the SAA is privately owned by numerous individuals and entities and some unknown proportion of this habitat may be managed in a manner that degrades the quality or completely eliminates the habitat.
- Commercial and private timber harvesting – Because some private timbering likely occurs on private lands within the SAA while bats are roosting in trees between 1 April and 30 September (15 November in the WAA), some unknown number are exposed to this stressor and may be directly killed, harmed, or displaced as trees are felled in the summer.
- Cutting of Snags - While most primary and many alternate roost trees are dead snags that are ephemeral/short-lived, some small proportion are likely to be cut down before they would naturally fall in order to provide firewood, to improve aesthetics, or to reduce the risk of a dead tree from falling and hurting someone/thing (i.e., hazard tree).
- Degraded water quality – Point and non-point source pollution and contaminants from agricultural, commercial, and residential areas are likely present in waterways within the Action Areas and may reduce aquatic insect biomass that form a portion of the northern long-eared bat prey base and/or have direct or other indirect adverse effects on the bats themselves (e.g., females may have reduced reproduction in heavily contaminated areas). In addition, in areas of karst topography, faulty septic systems can introduce untreated sewage into underground streams and subsequently affect hibernacula.
- Repeated human disturbance of hibernating bats – primarily caused by local and regional organized recreational cavers, spelunkers, and vandals. Most of the 55 hibernacula in the WAA are privately owned caves. Only a few of the caves are currently gated or fenced to prevent unauthorized human visitation.

White Nose Syndrome

No other threat is as severe and immediate for the NLEB as the disease, white-nose syndrome (WNS). If this disease had not emerged, it is unlikely the northern long-eared population would be declining so dramatically. Since symptoms were first observed in New York in 2006, WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast. Population numbers of NLEB have declined by 99 percent in the Northeast, which along with Canada, has been considered the core of the species' range. The degree of mortality attributed to WNS in the Midwest is currently undetermined. Although there is uncertainty about how WNS will spread through the remaining portions of the species' range, it is expected to spread throughout the United States. In general, the FWS believes that WNS has reduced the redundancy and resiliency of the species.

According to information from the Indiana Department of Natural Resources, Division of Fish and Wildlife (IDNR, DFW), WNS was first detected in Indiana in January 2011 during routine winter hibernacula surveys conducted by DFW bat biologists. By the end of that first winter, the disease had been found in six caves in Crawford, Monroe and Washington counties. During the next winter, bats exhibiting sign of WNS infection were observed in or reported from 20 additional caves that included six new counties (Greene, Harrison, Jefferson, Lawrence, Martin and Orange). Disease surveillance during the 2012-13 winter resulted in WNS detection from nine more caves that included only one new county (Jennings). Following the 2013-14 winter surveillance, signs of WNS were detected in two additional caves that included one new county (Vermillion). WNS is confirmed or suspected in 37 of 46 caves that have been surveyed in 11 Indiana counties. WNS is widely distributed throughout much of the karst region in south-central Indiana and locally established within most of the state's major concentrations of important bat hibernacula.

Indiana DNR biologists conduct population counts of hibernating bats every other winter. This biennial schedule minimizes disturbance yet still provides important information needed to monitor the status and health of winter bat populations. Since the initial detection of WNS in Indiana in 2011, biologists have obtained estimates of bat populations from 15 caves that have been infected with WNS for at least three winters. In these sites, the total population of all species combined has dropped from about 127,000 bats in the first winter to about 100,000 by the third winter, a decline of approximately 21%. The impact of the disease, however, appears to differ by species. During the same period, biologists tallied the following numbers for Indiana's most common winter bat species:

- little brown bats: 80% decline (from 8,760 in 1st WNS winter to 1,710 in 3rd WNS winter)
- eastern pipistrelles: 45% decline (from 1,040 in 1st WNS winter to 570 in 3rdWNS winter)
- Indiana bats: 16% decline (from 117,600 in 1st WNS winter to 98,400 in 3rd WNS winter)
- big brown bats: 4% increase (from 103 in 1st WNS winter to 107 in 3rd WNS winter)

Counts scheduled for the upcoming 2014-15 winter will provide the first opportunity to evaluate the impact of WNS on bat populations in Indiana's most significant hibernacula, most of which will have been infected for five winters (Indiana DNR website: http://www.in.gov/dnr/fishwild/5404.htm, accessed 9/2/2014).

Unfortunately, due to the northern long-eared bats preference for hibernating in cracks and crevices, hibernacula population estimates are not available for this species.

EFFECTS OF THE ACTION

As previously stated, the proposed action includes construction, operation, and maintenance of an Interstate highway, approximately 142 miles long, connecting Evansville and Indianapolis, Indiana. Approximately 35% of the proposed route is mostly within the footprint of an existing 4-lane highway, SR 37; however, the remaining 65% or approximately 90 miles of interstate has or will be constructed on entirely new right-of-way. The proposed action also involves constructing multiple interchanges (the actual number may change in Tier 2), as well as new local access roads, and improvements to existing roads.

At this time, construction of the roadway has been completed for Sections 1-3 or the first 67 miles. Clearing of trees is completed for Section 4 and the lower third of Section 5 (approximately from Beanblossom Creek south). Construction of the highway in Section 4 is expected to be completed in 2015 and work on Section 6 has not yet begun.

Since construction of the roadway is completed in Sections 1-3 and tree clearing has been completed in Section 4, INDOT and FHWA are not required to complete direct habitat impact analysis for Sections 1-4, but do need to complete indirect and cumulative impacts analysis in Sections 1-4. For Sections 5 and 6, the Service requested direct, indirect and cumulative impact analyses. Because tree clearing has been completed for most of the lower third of Section 5 (up to Beanblossom Creek) and the WAA extends about 1.7 miles further north, the Service requires only direct impact analysis for those locations within the WAA where tree clearing has not been completed.

Impact analysis in this document will be similar, but not exactly the same, as in the Tier 1 BA Addendum of March 2006. The 2006 analysis considered 13 Indiana bat maternity colonies, the remaining SAA that included 2.5 miles on both sides from the centerline for the roadway excluding the maternity colonies, and a circle 5 miles in radius around each of the 16 hibernacula (constituting the Indiana bat WAA) to complete the impact analysis. Analysis for the northern long-eared bat included 38 maternity colonies and the remaining SAA (1.5 miles on both sides from the edge of the right-of-way for the roadway for Sections 1-5, and 1.5 miles on both sides from the centerline of the representative alignment in Section 6). The WAA is defined as a circle 5 miles in radius around each of 55 hibernacula for impact analysis. Both the WAA and the SAA were expanded in areas were indirect development was forecasted to be contiguous with these areas. This information is based on the induced growth expectations within the Traffic Analysis Zones (TAZs).

While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

- <u>proximity of the action</u> to known species locations,
- <u>distribution of the disturbances</u> and impacts (in this case a linear corridor),

- timing of the effects in relation to sensitive periods in the species' lifecycle,
- nature of the effects – how the effects of the action may be manifested in elements of a species' lifecycle, population size or variability, or distribution, and how individual animals may be affected,
- duration of effects - short-term, long-term, permanent,
- disturbance frequency - number of events per unit of time, and
- disturbance severity - how long would it take a population to recover?

As was done for the Indiana bat in the original 2003 Tier 1 Biological Opinion, we have deconstructed the I-69 project into its various components and outlined the anticipated direct and indirect impacts and their effects on northern long-eared bats.

Using the same approach as was done for the I-69 project for Indiana bats, we looked at each project activity that may directly or indirectly affect the NLEB and outlined the likely responses of the bats and their local populations to each of these potential stressors. Our primary focus was placed on the 38 maternity colonies in the SAA and the 55 hibernacula in the WAA. We determined which of the project-related stressors was likely to result in take of NLEBs and conducted a detailed incidental take analysis for bats in both the SAA and WAA. The results of our effects and incidental take analyses are summarized in a series of four tables (Tables B1-B4) presented in Appendix B. Due to lack of population data for the 55 hibernacula, detailed take analysis during the hibernation period was not possible for the northern long-eared bat as has been done for the Indiana bat. Please review each of these tables for further information. Only key findings of these effects analyses are discussed in greater detail below.

Stressors

The primary, project-related stressors that we determined NLEBs were likely to be directly or indirectly exposed to that were also likely to cause some level of incidental "take" include:

- I-69 direct impacts/loss of roosting habitat
(seasonal cutting restrictions observed so no direct killing anticipated),
- I-69 direct impact/loss of foraging habitat,
- Harass/wound/kill/harm from disturbance and habitat loss associated w/private landowner clearing and timber salvage prior to INDOT purchasing property (assuming home owner/business owner chooses to not work with INDOT to avoid timbering property during maternity season and assuming northern long-eared bats are present),
- Construction noise/vibrations causing bats to stress and flee roosts, with increased risk of predation (while bats are present in adjacent areas),
- Disturbance and habitat loss associated with demolition and relocation of homes and businesses (no timing restrictions),
- Habitat loss from I-69 related utility relocations (seasonal cutting restrictions

observed so no direct killing anticipated),

- Additional high-speed traffic and increased speed in action area leading to roadkill,
- I-69 indirect/induced loss of roosting and foraging habitat (no restrictions/bats present)
- Increased levels of disturbance/vandalism of bats in vulnerable hibernacula

Other potential project-related stressors that bats may be exposed to, but are not anticipated to cause incidental take because of their insignificant or discountable effects are listed in Table B1 in Appendix B.

Responses of Exposed Bats to Stressors

With an understanding of how, when, and where NLEBs will be exposed to the proposed action, we then determined whether and in what manner these individuals are likely to respond after being exposed to the proposed action's effects on the environment or directly on the bats themselves. Our analysis followed the same approach as was used in evaluating project impacts on the Indiana bat which entailed identifying the range of possible responses NLEBs could exhibit as a result of being exposed to the project-related stressors (see Table B1 in Appendix B). To ensure a thorough analysis of effects, the range of probable responses, not just the most deleterious, for each exposure pathway were identified. As is true in humans, bats typically demonstrate some degree of individual variability as seen by their range of responses to various stimuli. Therefore, accurately predicting how a generic, individual NLEB may or may not respond to a stressor is an inherently difficult task with little scientific literature available for guidance. Nevertheless, following the same process we used previously for Indiana bats and general biological principles and logic, we identified the following range of responses of individuals and their local populations during or after exposure to project-related stressors:

0. no response
1. startled: increased respiration/heart rate
2. **death/injury of adults and/or offspring**
3. **flees from roost during daylight / ↑predation risk**
4. abandons roost site(s)
5. abandons foraging areas
6. shifts focal roosting and/or foraging areas
7. **↑ energy expenditures / ↓ fitness (short-term)**
8. ↓ energy expenditures / ↑ fitness (long-term)
9. **aborted pregnancy/repro. Failure**
10. **↑torpor, delayed development/parturition, and/or delayed sexual maturation of offspring**
11. **short-term ↓ colony reproductive rate (3-4 seasons)**
12. **short-term ↓ in colony/hibernaculum size (3-4 seasons)**
13. long-term ↑ colony reproductive rate

14. long-term ↑ in colony/hibernaculum size/fitness level
15. **long-term ↓ in colony/hibernaculum size/fitness level**

Response numbers 2, 3, 7, 9, and 10 are in bold because we anticipated that these negative responses are likely to rise to the level of take (as defined in the ESA) of one or more exposed NLEB in the action area. Similarly, responses 11, 12, and 15 are the negative responses to local populations that would result from take of individual bats.

Please see Table B1 in Appendix B, which identifies the specific behavioral and physiological responses of individuals and the demographic responses of local maternity colonies/hibernating populations that we anticipate will occur for each of the project-related activities.

Analysis of Stressors Causing Take of Individual Bats

Loss of Roosting and Foraging Habitat – Tree clearing is only planned to occur in Section 5 and Section 6 at this time. All other sections have already been cleared. In addition, it is likely that the clearing in Section 5 will be finished this winter (2014-2015) prior to the northern long-eared bat being listed. If this happens, then take of the species as a result of loss of roosting and foraging habitat will only be likely for Section 6 of the project. Because potential roost trees within the I-69 footprint will be cleared while bats are absent (between 30 September and 30 March in the SAA and 16 November and 30 March in the WAA), we do not anticipate any direct mortality from the felling of these trees. However, a few individual females from each of the maternity colonies may be taken once they return to their traditional roosting areas the following season and find that their primary or alternate roost tree is gone. Given the locations of the colony areas and the fact that Sections 5 and 6 will consist of upgrading an existing four lane highway, we feel it is unlikely that any primary maternity roost trees will be directly felled during the construction phase of I-69 (Table B3, Appendix B). It is possible that some number of occupied alternate roost trees typically containing far less than 30 bats may be felled and lead to the death or injury of some proportion (but not all) of the bats as a result of I-69 induced growth and/or the relocation of those people displaced by the interstate. We would expect this to be very minimal.

Because maternity colonies and individual male NLEBs commonly shift their use among multiple roost trees it is possible that some unoccupied roost trees will be felled as well. In this case no direct adverse effects or take will occur, but some indirect adverse effects could still stress some bats to the point where take is reasonably certain to occur. For example, it is possible that a few alternate roosts trees being used by one or more of the maternity colonies in Sections 5 and 6 are located within or near some of the proposed interchange areas and as a result a proportion of their alternate roosts (assuming primaries will remain standing) may be felled. Loss of multiple alternate roost trees would cause displaced individuals to expend increased levels of energy while seeking out replacement roost trees. If this increased expenditure occurred during a sensitive period of a bat's reproductive cycle (e.g., pregnancy) it is assumed that spontaneous abortion or other stress-related reproductive delays or losses would be a likely response in some individuals, particularly those that may have already been under other environmental stresses or perhaps stressed by other project-related stressors (e.g., increased noise levels). It has been hypothesized that these stresses and delays in reproduction could also cause lower fat reserves and ultimately lead to lower winter survival rates (the Service 2002). For example, females that do give live birth may have pups with lower birth weights or their pups may have delayed development *(i.e*., late into the summer). This could in turn affect the overwinter survival of the young-of-the-year bats if they enter fall migration and winter hibernation periods with inadequate fat reserves.

Because the footprint of this transportation project is primarily linear in shape, occurs partially along an existing four lane highway, and because most of the tree-clearing has already occurred, losses to any one patch or areas of important habitat (e.g., maternity colony area or hibernacula swarming areas) are automatically minimized. For most maternity colonies and hibernacula areas it appears that I-69 will not directly nor indirectly eliminate a significant amount of the existing forest cover, nor will it create any additional permanent barriers to movement among forest patches (see Table B2 in Appendix B).

Private Landowner Clearing in Maternity Colony Areas - One effect of the action that was not contemplated during the original consultation for the Indiana bat was the potential for private landowners to conduct timber harvests on their property prior to selling their land to the State for the project construction. INDOT's approach to purchasing right of way involves paying a landowner an amount comparable to other local, forested properties in the same market. This method of appraisal and valuation is known as the comparable sales approach, and is described in INDOT's 2011 Appraisal Manual. In some cases, it appears, landowners have found it more economically beneficial to conduct some amount of harvest on their properties prior to selling to the State. Unfortunately, this cutting often occurs during the summer maternity period.

In an effort to avoid and minimize this issue, INDOT and FHWA, in coordination with the FWS, have developed a new conservation measure which is now included in the official proposed action for the I-69 project:

> **Avoid and minimize impacts from private landowner harvests within the right of way -** The goal of the measure is to avoid and minimize impacts from private landowner harvests by working with property owners within the right of way who plan to harvest their property. FHWA and INDOT propose to develop an voluntary agreement with the interested landowners, such as a "right of entry" agreement or other type of covenant, to pay the landowner to limit the time of year in which they harvest their property; this time period would be limited to the late fall and winter when Indiana bats are not present in the forested areas.

Fortunately, these potential impacts are less likely to occur in Sections 5 and 6 because much of the proposed alignment falls within existing INDOT right-of-way.

Noise, Tree Felling, and Predation Risk – Most noise generated from project-related construction activities will likely occur during daylight hours when NLEBs are roosting in trees. Unfamiliar noises from the operation of chainsaws, bulldozers, skidders, trucks, etc. could occur in relatively close proximity to occupied primary and alternate roost trees during the summer reproductive season. The novelty of these noises and their relative volume levels will likely dictate the range of responses from individuals or colonies of bats. At low noise levels (or farther distances), bats initially may be startled and have increased respiration/heart rates, but they would likely habituate to the low background noise levels. At closer range and louder noise levels (particularly if accompanied by physical vibrations from heavy machinery) many bats would probably be startled to the point of fleeing from their day-time roosts and in a few cases may experience increased predation risk. Because the noise levels in construction areas will likely continue for more than a single day the bats roosting within or close to these areas are likely to shift their focal roosting areas further away or may temporarily abandon these roosting areas completely. Callahan (1993) noted that the likely cause of the bats in his study area abandoning a primary roost tree was disturbance from a bulldozer clearing brush adjacent to the tree. Female Indiana bats in Illinois used roosts at least 1640 ft (500 m) from paved roadways (Garner and Gardener 1992). Very low bat usage close to interstates has also been noted by other bat biologists (Whitaker, Jr. per. comm.). Conversely, some Indiana bats did use roosts near the I-70/Indianapolis Airport area, including a primary maternity roost

This primary maternity roost was not abandoned despite constant noise from the Interstate and airport runways, however; their proximity to the Interstate could also have been due to lack of more suitable roosting areas and furthermore the noise levels from the airport were not novel to the bats, so they had apparently habituated to them (USFWS 2002).

In areas that may experience induced growth or private landowner cutting, we assume that some bats that would be startled by the noise and vibrations coming from a chainsaw would successfully exit their roost trees prior to the tree being felled. Bats that remained in a roost tree and survived the initial felling would likely try to crawl and fly away from the immediate area, but being unaccustomed to flying during the daytime and likely injured or disoriented from the fall, would likely have a relatively high risk of predation from diurnal predators. Bats that successfully flee the disturbance uninjured would not be expected to return to that area and would likely shift their focal roosting (and perhaps foraging) area at least temporarily. We assume that any surviving young that were still nursing and non-volant (i.e. too young to fly) would soon die if their lactating mothers were directly or indirectly killed by a felled roost tree during the middle of the maternity season.

Highway Noise

Highways are linear noise sources in which the tire/pavement contact, engine and exhaust generate sound at various pressures and frequencies. For interstates such as I-69, steady state A-weighted sound pressure levels of 66 dB or greater are anticipated at distances of 250 feet from the roadway and possibly as far as 350 to 400 feet from the roadway depending on the volume of traffic predicted for the design year, and then decrease with distance from the roadway to lower levels (Tier 2 Section 5 DEIS).

It is unclear exactly how bats may react once the new highway becomes fully operational. Some studies indicated very low bat usage close to interstates and others indicate that some bats will roost and forage near large roadways. The latter may be a factor of available surrounding habitat and habituation over time to the noise. The completion of I-69 will produce new noise levels with the upgrade of the principal arterial road (SR 37), increased traffic on newly opened Sections 1-3, and new traffic on soon-to-be operational Section 4. Since this project involves more of an increase in traffic as opposed to novel traffic noise, we anticipate noise impacts to be minimal.

Roadkill - Roadkill may also result in direct death of maternity colony members (and is likely currently occurring to some extent); the full effect of the take is not anticipated to occur until the entire interstate is constructed and fully operational (*i.e.* free flowing traffic on all six sections). Until such time we expect more localized changes in traffic. In addition, some direct mortality from roadkill may be compensatory rather than additive as the number of roadkills currently occurring on other local roads may decrease as traffic shifts to completed segments of the new I-69 roadway. Because five of the six sections are already operational to varying extents, we do not expect roadkill deaths to escalate significantly in these areas. Some rise could occur due to overall increased traffic volume and faster moving vehicles, particularly once Section 4 is constructed.

Studies on Indiana bats, a species considered to be very similar to the NLEB, indicate that they typically avoid crossing over open areas (Brack 1983; Menzel *et. al.* 2001) although they have been documented flying over busy interstate highways such as I-70 near the Indianapolis Airport (USFWS 2002) and U.S. Route 22 near the Canoe Creek Church in Pennsylvania (Butchkowski 2003). In both of these circumstances, however, the road lies between known roosting and foraging areas for members of the colonies (Butchkowski 2003; D. Sparks, ESI, Inc., pers. comm. 2005). While it has been shown that Indiana bats will cross over busy highways when they separate foraging from roosting areas, it should also be noted that through a radio telemetry study done by Indiana State University, Sparks observed that individuals of the Indianapolis Airport Colony avoided flying over I-70 where a bridge provided a 35-ft high corridor beneath the road pers. comm.). The results of this particular study indicate that bats may avoid flying over highways when an alternative corridor is present. Recent research published by Zurcher *et. al*. 2010 indicates that bats may actually avoid traffic. In this study, bats were more than twice as likely to reverse their flight course while approaching a road when vehicles were present. They found that when automobiles were present, 60% of bats exhibited avoidance behavior and reversed course at an average of 10 meters from the oncoming vehicle. Conversely, when no automobiles were present, only 32% of bats reversed their course and 68% crossed the road.

Therefore, although it is logical to assume that some roadkill may occur, the amount of roadkill attributable to I-69 is somewhat speculative and will be difficult to detect. As the Service does not have a standard means for estimating the likelihood of roadkill, we estimated roadkill for each colony by starting with the assumption that some proportion of bats in a colony (100/colony) would be exposed to I-69 traffic and had a 5% risk of being hit and killed over the course of a 16 year period (this assumes a fully operational, completed interstate and is a similar method as used for the Indiana bat Section 7 consultation for this project). The roadkill estimates used for this project represent what we believe to be a reasonable worst-case scenario and could be reevaluated during subsequent consultations if more detailed information or data becomes available (*i.e.*, Tier 2 consultation for Section 6). The preferred alternative runs along the outer edge of numerous maternity colonies and likely does not separate large portions of roosting and foraging habitat in these instances, therefore further reducing the likelihood that roadkill is a significant form of take of NLEBs in many colony areas.

We anticipate that bat-auto collisions (*i.e.*, roadkill) on the proposed interstate would be the single largest cause of take to NLEBs within the Summer Action Area (n=55 bats over 16 years) and likely the second leading cause of take in the Winter Action Area (however winter population numbers are not available) (see Table B4 in Appendix B). Because we expect that the total amount of take will be evenly spread over a projected 16-year period of time, we anticipate that the annual amount of take for any given maternity colony or hibernating population will be insignificant. For example, we have conservatively estimated that portions of each colony of 100 bats, depending on how much of the alignment passes through a given colony, have a 5% chance of take as a result of roadkill over the course of 16 years. This has resulted in an estimated take of no more than 7 bats total every 2 years for all of the 25 colonies through which the roadway traverses, combined. This amount of roadkill is insignificant at the regional or species level.

Increased Risk of Disturbance/Vandalism of Bats in Vulnerable Hibernacula - Because I-69 is anticipated to induce indirect development and thereby increase the human population within the WAA and will provide improved, convenient accessibility to people that live outside the WAA (*e.g.*, via the proposed Greene/Monroe county line interchange), we believe it is reasonable to assume that a small proportion of these "new" people will want to explore the caves in the area and will thereby increase the inherent risk of disturbing hibernating NLEBs within caves that are currently unprotected (*i.e.*, ungated and/or unfenced). In a reasonable worst-case scenario an unauthorized visitor(s) or vandal(s) would enter a hibernaculum and directly or indirectly kill/take (*e.g.*, direct, physical contact with bats is not required for arousal to occur and essential fat reserves to be depleted and subsequently leading to starvation) NLEBs. While this scenario could still occur with or without I-69, we believe that it is more likely to happen with the proposed interstate and interchanges in place (*i.e.*, overall improved accessibility). However, the Service believes it is extremely unlikely (*i.e.*, discountable) that I-69 would cause an increased risk of someone physically altering or vandalizing unprotected caves to the degree that they would no longer remain suitable habitat. Typically, the worst physical alterations to the caves themselves are likely to be an increased prevalence of spray-painted graffiti and trash.

Specific estimates of take as a result of increased risk of disturbance are difficult to make at this time due to a lack of information concerning local cave populations of the NLEB. Fifty-five caves were shown to have some sort of fall/winter/spring NLEB activity based on harp trapping and limited internal cave surveys in the WAA.

Short-term Water Quality Impacts - Water quality affects the bats in the Action Areas in terms of their aquatic insect prey and drinking water sources. In general, the streams in the Action Areas exhibit a wide variety of aquatic habitat types and associated species. The project area has many ephemeral, intermittent and perennial streams with narrow riparian areas that will be crossed by I-69. There is some potential for sediment to move down the ephemeral channels into intermittent and perennial streams after rainfall events. Removal of vegetation during or after grading activities could potentially cause short-term adverse effects on the hydrologic characteristics and water quality in a watershed. A reduction in vegetative cover could potentially increase water yield and stream discharge; changes in vegetation cover could alter normal nutrient cycles in both terrestrial and aquatic systems, and use of temporary access/construction roads and trails during the construction phase could cause soil erosion leading to sedimentation. Potential effects from removal of vegetation and soil disturbance would be temporary. Proposed soil erosion and sediment control measures such as riparian vegetative buffer strips, equipment limitation zones, contouring for drainage control, outsloping roads, and providing waterbars, mulching, and seeding would be implemented and greatly reduce water quality degradation. Finally, some small potential exists for accidental fuel/oil spills or spills of other hazardous materials from chainsaws and heavy equipment during the pre-grading forest clearing phase and related roadwork, which could degrade the quality of both surface and ground water, but given the degree of project oversight, we believe the odds of a large spill occurring and entering a waterway are discountable. Although water quality could also be adversely affected during a major spill or accident once I-69 is operational, the probability of this is not known.

Risks to Bat Populations in the Action Area

Maternity Colonies – Based upon mist netting efforts during the summers of 2004 and 2005 and monitoring mist netting in 2008-2014 (9 years total effort), it was determined that there are 38 northern long-eared bat maternity colonies and their associated foraging areas within the I-69 SAA. A maternity colony consists of reproductively active female northern long-eared bats and their young. A maternity colony was determined to exist if there was evidence of reproduction in an area during the summer reproductive season (the capture of a reproductive female or juvenile). Each maternity colony foraging area is a circle with a 1.5-mile radius. The 1.5-mile distance was determined in consultation with the Service. A 1.5-mile distance was also used to determine the width of the SAA by buffering the right-of-way for Sections 1 through 5 and the Representative Alignment for Section 6. Maternity colony foraging area circles were centered on mist net sites of northern long-eared bat capture or centroids from multiple mist net capture locations where such locations were in generally close proximity to each other. The 38 maternity colonies for the northern long-eared bat are shown on Exhibit 3 of the NLEB BA. These maternity colonies were developed by the Service (BFO) using the best data available which included capture data (especially reproductive females and juveniles); following habitat descriptions in scientific publications; and use of existing maps (*e.g.*, USGS, NWI, Soil Survey, aerials, etc.).

The 38 northern long-eared bat maternity colonies have been named after an associated river, stream or notable landscape feature. Because of their position in the landscape, several of the colonies overlap each other. Table 4 lists the 38 colonies by Section and indicates the percentage of area overlap with adjacent colonies.

Table 4 Colony Area Overlap Percentages for I-69 Northern Long-Eared Bat Colonies

Section	Colony	% Overlap	Overlap Colonies
Section 1	Pigeon Creek South	33%	Pigeon Creek North
	Pigeon Creek North	33%	Pigeon Creek South
Section 2	Patoka South Fork	46%	Robinson South, Robinson North, Flat Creek
	Robinson South	43%	Robinson North, Patoka South Fork, Flat Creek
	Robinson North	56%	Robinson South, Patoka South Fork, Flat Creek
	Flat Creek	48%	Robinson North, Patoka South Fork
	East Fork White River	22%	Aikman Creek

	Aikman Creek	22%	East Fork White River
Section 3	Thousand Acre Woods	0%	N/A
	North Fork Prairie Creek	0%	N/A
	Smothers Creek	0%	N/A
	White River - Weaver Ditch	41%	White River - Fourmile Creek
	White River - Fourmile Creek	50%	White River - Weaver Ditch, First Creek West
	First Creek West	10%	White River - Fourmile Creek, First Creek East
	First Creek East	2%	First Creek West
	Doans Creek West	13%	Bogard Creek
Section 4	Bogard Creek	30%	Doans Creek West, Doans Creek East
	Doans Creek East	43%	Bogard Creek, Black Ankle Creek
	Black Ankle Creek	32%	Doans Creek East, Plummer Creek
	Plummer Creek	6%	Black Ankle Creek
	Mitchell Branch	21%	Little Indian Creek Monroe
	Little Indian Creek Monroe	21%	Mitchell Branch
	Indian Creek South	55%	Indian Creek West, Indian Creek North
	Indian Creek West	75%	Indian Creek South, Indian Creek North
	Indian Creek North	44%	Indian Creek West, Indian Creek South
Section 5	Beanblossom East	47%	Beanblossom West
	Beanblossom West	47%	Beanblossom East
	Indian Creek Morgan	13%	Bryant Creek South
	Bryant Creek South	44%	Indian Creek Morgan, Little Indian Monroe
	Little Indian Monroe	36%	Jordan Creek, Bryant Creek
	Bryant Creek North	5%	Little Indian Creek Morgan
	Jordan Creek	4%	Little Indian Monroe
	Little Indian Creek Morgan	5%	Bryant Creek North
	Lambs Creek	0%	N/A
Section 6	Clear Creek East Fork	24%	White River
	White River	24%	Clear Creek East Fork
	White River - Goose Creek	0%	N/A
	Pleasant Run	0%	N/A

For the purposes of this study and using existing published data, the Service considers all maternity colonies of the northern long-eared bat to be comprised of 50 reproductively active adult females and 50 pups. This would result in a maximum of 100 bats per colony once the young are volant. This assumption is based on documented maternity colony sizes throughout the northern long-eared bat's range. Unfortunately, no roost trees were identified and thus no emergence counts to assist in developing the maternity population estimate.

We estimated that during the first 16 years of the I-69 project that a maximum combined total of 90 adult female and juvenile Indiana bats may be taken directly or indirectly by project-related activities (see Table B4 in Appendix B). For perspective, even if all of this take were to occur within a single reproductive season (again this is not anticipated), it would only cause a relatively small decline in the estimated annual local breeding population (90/3800 bats = 2.3% loss) within the Summer Action Area. We anticipate that take of these individuals would likely be spread among many of the 38 maternity colonies, not just a few. Under no likely scenarios, is the estimated amount of loss/take of reproductive individuals likely to cause an appreciable long-term change in viability of an individual maternity colony let alone to the species' regional or range-wide status. At **worst**, only short-term (2 or 3 maternity seasons) reproductive loss and reduction in numbers at a few local maternity colonies is anticipated as a result of the proposed action. In none of the maternity areas is the amount of proposed tree clearing or anticipated induced development believed to be extensive enough to cause a maternity colony to be permanently displaced from its traditional summer range. If however, our suppositions are wrong and these maternity colonies are displaced, there is currently additional suitable habitat available in adjacent areas that they could relocate to with minimal effort (personal observations based upon aerial photo interpretations).

Please refer to Tables B2 – B4 for a comparison of anticipated impacts among the 38 maternity colonies. As indicated in Table B3, **despite the direct and indirect impacts from I-69 and other cumulative impacts, the Service believes that all 38 of the maternity colonies should still be able to persist in their current maternity areas, especially if proposed mitigation efforts are successful.**

In summary, the following effects are anticipated for the 38 maternity colonies within the SAA:

- Habitat loss will be minimal for all colonies: total forest impacts (including direct, indirect, and cumulative) ranged from less than 1 acre for Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek, White River – Weaver Ditch, White River – Fourmile Creek, First Creek East and Bryant Creek North maternity colonies; 1-10 acres for 14 of 38 maternity colonies; 11-20 acres for 9 of 38 maternity colonies; 21-41 acres for 3 of 38 maternity colonies; and 50, 55, 58, 66 and 71 acres for White River, Beanblossom East, Indian Creek Morgan, Clear Creek East Fork and Bryant Creek South. Collectively, the total forest cover impact for the composite maternity colony area of 148,790 acres is estimated at 448 acres or 0.3% - the majority related to cumulative impacts. So, the total amount of forest loss is relatively insignificant for each colony. It is also unlikely that any maternity area would experience a significant long-term decrease in quality of roosting or foraging habitat as a direct result of I-69, particularly since most of the roadway is either already operational or consists of upgrading existing SR 37, a four-lane state highway.
- We anticipate that bat-auto collisions (*i.e.*, roadkill) on the proposed interstate would be the single largest cause of take to NLEBs within the Summer Action Area (n=55 bats over 16 years).
- Seasonal tree-cutting restrictions will ensure no direct impacts/take occurs from this activity during the maternity colony season.

- Primary roost trees are not likely to be destroyed in any of the maternity colonies since the tree-clearing has already happened for Sections 1-4 and Sections 5 and 6 are along existing SR 37 (Appendix B, Table B3); primary roosts trees were not located for any of the NLEB colonies since no telemetry has been done yet for the species in the action area.
- All maternity colonies have additional habitat that is available nearby if some bats should become displaced.
- Forest mitigation within each maternity area will insure suitable roosting and foraging habitat persists in these areas in perpetuity.

Although there may be some short-term impacts to individuals, these impacts are not likely to affect a colony's long-term reproduction and survival. Thus, all NLEB maternity colonies are likely to persist within the SAA following the I-69 project.

Local Populations of Males– Because adult males (and presumably many non-reproductive females) do not participate in the rearing of offspring, they typically lead solitary lives or in some cases gather in small bachelor colonies during the summer. Because these individuals are not burdened with a dependent young they presumably would be more apt to flee from their roost trees than reproductive females would be when faced with a disturbance. Therefore, it is very unlikely that the felling of an occupied roost tree would ever have more than a few adult males in it at any one time and even more unlikely for take of more than one male to occur per event. We assume a very small number of adult males may be taken as a result of the proposed action; however, we do not have adequate data on the number of males in the area to determine a number of individuals affected. The potential loss of a relatively small number of male bats will have no measureable or significant impact on the non-breeding NLEB population in the Action Areas or beyond.

Hibernating/Swarming Populations – No direct adverse impacts are anticipated to any of the 55 physical cave structures in the WAA that are thought to serve as NLEB hibernacula. Two caves have known hydrological connections to the Preferred Alternative. They are Cave and Cave. Cave has one known hydrological connection to I-69. Drainage downslope from I-69 in a surface tributary drains through swallet 4-0037 which was dye traced to Cave. There is potential for accidental spills or releases from the I-69 roadway to affect water in a part of the Cave stream. The spring at the lower end of Cave is being monitored with water quality samples during construction. Four NLEBs were harp trapped during the fall of 2004 in Cave; a winter survey of the cave did not find any NLEBs. The Cave recharge area was determined with dye tracings as a part of the Section 5 Tier 2 Karst Studies and a portion of the recharge area is located inside the existing SR37 right-of-way over the cave stream. Surface water in this area drains downward toward Cave and if this water has impaired quality then there is potential for impacts to the cave. There is no known data indicating the thickness of roof rock over the top of Cave below SR 37. There is potential for structural impacts related to seismic accelerations or extreme changes in groundwater conditions, but no concerns have been documented. Cave was found to have three NLEBs in the spring of 2005 and none were recorded during the 2004 fall harp trapping nor the 2004-05 winter survey.

Although there does not appear to be a hydrological connection to the right-of-way, Cave is in close proximity to the roadway (approximately . Forty-one NLEBs were harp trapped here in the fall of 2004 and 36 in the spring of 2005. One NLEB was found during the winter cave survey in 2004-05. In addition, Cave lies down gradient from the roadway; although no known hydrological connections to I-69 exist for these two caves, there is a potential for some to exist.

Cave has the most documented use by NLEBs in the action area. Two hundred seventy-eight NLEBs were recorded using the cave during the Fall/Winter/Spring time period. This cave is over 2.5 miles away from the alignment and no direct impacts are anticipated; indirect and cumulative forested habitat impacts are expected to be less than 1%.

These caves will be recognized by FHWA and INDOT as northern long-eared bat hibernacula and receive karst protective measures, as appropriate. Much effort has been taken to protect groundwater resources and cave systems in Sections 4 and 5. FHWA and INDOT have been working with IDNR, IDEM, and the Service in following the Karst MOU dated October 1993 in Section 4 and will continue such coordination and efforts to protect groundwater resources and cave systems in Section 5. Clearing of trees has been completed in these areas of Sections 4 and 5.

Habitat Impacts to WAAs

The direct impact analysis focuses on how the direct transformation of land from its current state to an Interstate and its associated interchanges, frontage roads, access roads, grade separations, and other road improvements impact the foraging areas for each of the proposed hibernacula. Each hibernaculum foraging area is approximately 50,265 acres (79 square miles) in size. Hibernacula foraging areas overlap each other and collectively form the WAA. Impacts for each hibernaculum foraging area cannot be added together to determine a total. Collectively, the total WAA area is 333,185 acres or approximately 521 square miles and also includes a small area at the south end of the hibernacula circles that includes TAZs taken into consideration for the indirect and cumulative analysis.

Direct forest cover impacts within the cave foraging area circles resulting from any remaining interstate construction (Sections 5 and 6) ranged from 0 or less than 1 acre for 46 of 55 hibernacula foraging areas to 17 acres and 38 acres for Cave and Cave, respectively. The remaining 7 caves had 2-3 acres of impact each. Forest cover impacts were 1% or less of the forest cover within the hibernacula foraging areas. Forest core impacts ranged from 0 or <1 acre for 53 of the 55 hibernacula to 3 acres and 4 acres for the Cave foraging area and the Cave foraging area, respectively. Impacts to forest cover and core forest are very small because construction in Section 5 is partially completed and primarily along existing SR 37. The remaining impacts are to the forest edge. Table 24 of the NLEB BA has detailed data for each hibernacula, as well as Appendix F of the NLEB BA.

The bulk of anticipated take to bats residing in the WAA is likely to be caused by unauthorized, human disturbances of hibernating bats in vulnerable hibernacula and roadkill of foraging bats (would primarily occur during the annual swarming period in late summer and fall). It is not possible at this time to determine the number of bats that may be exposed to these types of incidental take. Although there is information indicating which caves have records of NLEB use, we do not have population data for any of the potential hibernacula. While it is possible that an increase in human vandalism/disturbance and roadkill may occur (in comparison to what is already occurring in the area due to existing SR 37), the anticipated levels of take for these two threats are not likely to significantly impact the regional populations and are not expected to jeopardize the species.

The "Winter Action Area Hibernacula Analysis" chapter and Appendix F of the NLEB BA should be consulted for more detailed information regarding anticipated impacts for each hibernaculum and the WAA as a whole. Specific take numbers were not developed for the various NLEB hibernacula (as was done for the Indiana bat) due to a lack of population data.

The impact WNS may have on the ability of the NLEB to persist and recover is presently unknown. We currently do not have estimates of adult survivorship, juvenile survivorship, or fecundity for NLEB populations affected by WNS. The impact the project will have in light of WNS is also unknown at this time; however, based on what we currently know, WNS is the primary threat to the NLEB and even if all habitat-related stressors were eliminated or minimized, the detrimental impacts of WNS would still occur.

Indirect/Induced Impacts

Indirect effects are defined for the purposes of the Endangered Species Act (ESA) as those impacts that are caused by or will result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action.

Induced Growth

For the induced growth portion of the indirect (and cumulative) impacts analysis, the Regional Economic Models, Inc. (REMI) model was used during the Tier 1 NEPA process to calculate the projected population and employment changes in each of five economic zones within the I-69 study area for the year 2030. Growth for each region was allocated into Traffic Analysis Zones (TAZs). Changes in land use were calculated for both the No Build and the Build conditions. Population changes (*i.e.*, number of new households) were converted to acreages by multiplying the number of households by a factor of 0.21 to 0.26 acres per household depending upon the region. The acres per household factors were determined by weighting the percentage of single-family dwelling units (3 units per acre) and multi-family dwelling units (7 units per acre) based on differing regional statistics. Employment changes were converted to acreages by multiplying the number of new employees by a factor of 0.05 to 0.065 acres per employee depending upon the region. These factors were developed for each region based on various housing and commercial/industrial development factors. The cumulative impacts are those forecasted to occur without the proposed I-69 construction (No-Build). The indirect impacts are those that would occur solely as a result of the I-69 construction (Build).

A total of 90 acres of induced development impact is predicted to occur within all of the **maternity colony areas** (24 acres are estimated to be forested). Total indirect development for the entire **Remaining SAA** was estimated at 709 acres, of which 123 are forested. The expert land use panel identified TAZs (traffic analysis zones) along the project corridor and near the various proposed interchanges as the probable locations of that induced development (see page 188 and Appendix E of the NLEB BA for more discussion and detailed information about individual maternity colonies and their associated TAZs).

Forest cover impacts resulting from indirect development that fall within the **WAA** were estimated at 99 acres or <1% of the total forest cover available in the area. Forest cover impacts ranged from 0 acres for Cave to 46 acres for Cave. All forest cover impacts resulting from indirect impacts were 0 or <1% of the total forest cover available to the individual foraging areas. These impacts overlap those in the maternity colony areas and the Remaining SAA and should not be double counted.

The Service gives deference to the “expert land use panel” on the issue of where induced development is most likely to occur. Thus, we anticipate a very small amount of incidental take of NLEBs as a result of induced development in forested areas. The amount of induced/indirect development predicted to occur within each maternity colony area and the remaining SAA is presented in Table 17 and Table 23 of the NLEB BA, respectively, and is considered insignificant and discountable, as is the indirect development predicted in the WAA (see Table 25 of the NLEB BA).

Effects on Habitat Quality

In addition to direct habitat loss, proposed actions may result in a decrease in the quality of remaining habitat within the action areas. Factors that may lead to a loss in the quality of remaining habitat include: increased habitat fragmentation; increased human disturbance (*e.g.*, more lighting associated with road improvements, increased traffic and associated noise); decreased foraging habitat over piped or relocated streams; impacts to karst habitat as a result of changes to infiltration and surface water runoff patterns, including introducing contaminants to karst resources; and impacts to water quality as a result of construction activities, road salts, motor oil, and various hazardous materials leaked during traffic accidents. Over time, it is expected that fragmentation of habitat in the Summer and Winter Action Areas will increase as new indirect development occurs. However, as the mitigation plantings mature into suitable NLEB habitat this may be partially compensated.

Noise/Lighting

Increased human disturbance in the project area may affect the quality of summer bat habitat, but these effects are expected to be relatively minor. However, human disturbance within an unprotected NLEB hibernaculum could be severe. Some NLEBs in the action areas that have not previously been exposed to artificial lighting, high noise levels and highway traffic may avoid habitat near I-69, but this will probably only be a relatively minor adverse effect of the project, as a four-lane highway is already operational in 5 of the 6 sections.

Water Quality

During construction, water quality may be temporarily adversely affected in streams (*e.g.*, increased siltation) where NLEBs may drink and presumably obtain a small portion of their insect prey. Water quality impacts that may result from the proposed project include the relocation of stream channels, increased sedimentation as the result of construction activities, and increased runoff (and associated pollutants) from newly constructed roadways. All wooded stream channels that must be relocated will be planted with hardwood seedlings (legal drains may be an exception), which are expected to stabilize the banks; eventually trees are expected to provide shade to the riparian corridor, a source of woody debris to provide in-stream habitat, and NLEB foraging cover. Until these newly relocated channels become established, they will not provide good foraging habitat for bats. Consultation with the FHWA and INDOT will be ongoing to insure that relocated stream channels produce viable aquatic systems. Aquatic communities will be monitored post-construction and remedial actions will be required if established criteria are not met. Erosion control plans will be implemented during all construction activities. Because the bulk of the bats' prey base is made up of terrestrially based insects (Feldhammer et al. 2009; Brack and Whitaker 2001), short and/or long-term adverse effects to local water quality are not likely to rise to a level where incidental take of NLEBs is reasonably certain to occur.

The INDOT has committed to include measures for spill prevention and containment in the roadway design, incorporate herbicide use plans and low salt zones in sensitive areas (including karst), and to design bridges with no or minimal in-span drains and to direct bridge runoff away from streams and rivers.

Karst

Karst habitat is a non-renewable resource that is biologically important because it provides habitat for a number of rare, threatened, and endangered species that depend on caves to different degrees. Many species of bats, including the NLEB, use caves in karst areas within the WAA of I-69. Some anticipated karst impacts may include: sediment-laden run-off to sinking streams, cave recharge areas, or sinkholes; filling in sinkholes or reopening buried sinks; collapse and exposure of karst conduits; and blocked spring outlets and recharge pathways. Drainage patterns could be altered either increasing or decreasing typical flow patterns.

FHWA and INDOT have been working with IDNR, IDEM, and the Service in following the Karst MOU dated October 1993 and will continue such coordination and efforts to protect groundwater resources and cave systems. Karst features in the project are solely in Sections 4 and 5. Impacts to specific karst features have been and will continue to be addressed via consideration of alternative drainage and other appropriate mitigation features during final design. Such treatment measures include peat and sand filters, gravel filters, vegetated buffers, and lined spill or run-off containment structures.

Effects of Avoidance, Minimization and Mitigation Measures

Forest Mitigation

The FHWA and INDOT have incorporated measures into the proposed project design to avoid, minimize and mitigate the impacts of the project to the extent practical. Proposed avoidance, minimization and mitigation procedures are discussed in the **Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan** (see Appendix D of the 2006 Tier 1 BA Addendum) and the recently revised **Conservation Measures** (page 9 of the NLEB BA), which has been updated to include the NLEB. This information is incorporated by reference.

During the Tier 1 and Tier 2 consultations for the Indiana bat, the FHWA and INDOT committed to mitigate for the permanent and unavoidable loss of forests (3:1 ratio) and wetlands (ratios vary) within the action areas by purchasing existing habitat, and/or creating, restoring, and enhancing habitat. Due to similarities in the two species, we believe these mitigation properties will also benefit the NLEB and help to mitigate and minimize project impacts on this species.

Based on estimates of total project impacts, the mitigation acreage could total up to approximately 6,400 acres. The actual mitigation acreage will be determined based on impact acres and the committed ratios which could provide higher or lower mitigation acres than the amounts estimated in the NLEB BA. To date, 50 mitigation properties in Sections 1-4 (totaling over 5,500 acres) have been purchased. Another 25 properties in Section 5 are currently being pursued. Some mitigation areas will be planted with a mixture of native hardwood seedlings and all sites will be protected in perpetuity. The goal of the plantings will be to enhance Indiana bat and NLEB habitat in the long term by providing forested habitat, improving connectivity among blocks of existing habitat, and creating larger blocks of forested bat habitat. The specific sites proposed for plantings will also be located to improve the connectivity of forested habitat within the range of maternity colonies that would be adversely affected by I-69. Improved connectivity of habitat between roosting and foraging areas is expected to improve habitat conditions for both NLEBs and Indiana bats. Permanently protected plantings along stream corridors will also benefit water quality in the long term, as the plantings will provide a vegetated buffer that will reduce runoff, and associated sedimentation, from adjoining roadways, commercial/industrial developments, and agricultural areas. In the long term, mitigation plantings will provide a diverse woodland that is well stocked with species of trees that are known to provide NLEB and Indiana bat roosting habitat. Plantings will be monitored to insure that at least 80% of the initial planting survives; if survival is below 80% five years after planting, then remedial measures will be taken. There will be no manipulation of vegetation (e.g., mowing, timber harvest, timber stand improvement, firewood collecting) in these mitigation areas without consultation with the Service's BFO. In addition, four Indiana bat hibernacula have been purchased and protected, three of which are known to be used by NLEBs in the winter. A fourth cave known to have NLEB use in the winter has also been purchased. A deed restriction or conservation easement will be recorded for the properties and will provide permanent protection. Details of specific mitigation projects are described in the NLEB BA starting on page 48.

An extensive monitoring and research program is also proposed by the FHWA and INDOT. Therefore, the NLEB colonies discovered in the action area will be studied and monitored the summer prior to and at least 5 summers post-construction, beginning with the first summer following the start of construction (radio-tracking for the NLEB will apply to the colonies in Section 5 and Section 6 since tree clearing activities and construction have already occurred in Sections 1-4). The details of the proposed monitoring plan will be developed in consultation with the Service. The environmental benefits of these sites will be significant and will continue to increase as the sites mature.

The FHWA and INDOT will also work with the Service's BFO to design an educational poster and interpretive displays about the NLEB.

Wetland Mitigation

Mitigation plans to offset unavoidable wetland impacts will comply with INDOT's MOU (1991) as noted during Tier 1. The overall I-69 project proposes wetland replacement at a ratio of 3:1 or 4:1 depending on quality for forested wetland impacts. A ratio of 2:1 or 3:1 for Scrub/Shrub wetland impacts and emergent wetland impacts will be replaced, depending upon their quality. Impacts to open water are proposed to be mitigated at a ratio of 1:1 and may be mitigated using borrow pits.

Landowner Coordination

In an effort to avoid and minimize impacts to Indiana bats, and now NLEBs, and their habitat as a result of private landowner clearing within and adjacent to the I-69 right of way, INDOT and FHWA, in coordination with the FWS, have developed a new conservation measure which is now included in the official proposed action for the I-69 project (see Appendix D, item A16, of Amendment 2 of the Tier 1 RPBO, 2013). FHWA, through INDOT, plans to mitigate impacts of out-of-season logging by providing private landowners within the approved right-of-way, who express an interest or intent to harvest timber, a mechanism to avoid or limit their harvesting activities to the November 15-March 31 timeframe within the WAA and the October 1-March 31 timeframe in the SAA. Options may include a "right of entry" agreement or other type of covenant or agreement between FHWA/INDOT and the landowner. FHWA, through INDOT, will contact landowners of property within the right-of-way to discuss opportunities for deferring tree clearing activities to the approved tree-clearing timeframes. This will voluntarily limit the timing of private timber harvest to a period when NLEBs and Indiana bats are not present in the action area. These offers will be made on a case by case basis in coordination with the Service's Bloomington, Indiana Field Office.

Impacts Summary

In summary, the following effects on NLEBs in the action areas are anticipated:

- Direct habitat modification/loss will occur, but will be minimal with a direct forest cover loss within the maternity colony areas totaling 211 acres. Per colony, these impacts range from 0 acres (28 maternity colonies in Sections 1 through 4 and 3 maternity colonies in Section 5) to as high as 64 acres for the Bryant Creek South colony in Section 5. Forest cover loss ranged from 0 % to 1.6% of the forest cover within the maternity colony foraging areas. Therefore, the total amount of forest loss is relatively insignificant. It is also unlikely that these maternity areas would experience a significant long-term decrease in quality of roosting or foraging habitat as a direct result of I-69, based on the amount and quality of remaining forest habitat, the location of the alignment, and the fact that Sections 5 and 6 consist of upgrading of an existing four-lane facility.

- Direct forest loss within the Remaining SAA (the area outside of the maternity colony areas) is estimated to be 275 acres, or 0.2% of the available forest.
- Seasonal tree-cutting restrictions will ensure no direct impacts/take occurs from the construction of I-69 during the maternity colony season. INDOT has also extended this restriction to include all borrow areas used by construction contractors, as well as utilities that are coordinated with them.
- Indirect loss of forest or wetland habitat from residential and commercial development is anticipated to be fairly small and minimal impacts are expected, particularly in the maternity colony areas.
- No known primary or alternate roost trees will be impacted within the estimated maternity colonies. Given the capture location of the bats and the location of the I-69 alignment, it is unlikely that any primary maternity roosts are within the proposed alignment that will be cleared for I-69. Thus, no take is anticipated from the loss of a primary roost tree. Loss of unidentified alternate roost trees may occur, but this is limited given the location of the proposed alignment.
- Because construction in Sections 5 and 6 primarily involves the upgrade of an existing four-lane facility, impacts to existing stream crossings and bat travel corridors are expected to be minimal. In most cases, current stream crossings will be maintained or improved upon (longer spans, redirection of road-runoff, etc.). If any of the existing stream crossings are currently used as corridors for bats, the upgraded structures should continue to provide areas for bats to connect to existing habitat and safely cross under the interstate. Some additional structures may be developed for access roads and interchanges but we expect impacts to bat movement to be minimal from such structures.
- Death/kill from collision with vehicles once the roadway is fully operational is anticipated on I-69 and other local roadways when traffic volume and speed increases. We anticipate no more than approximately 7 bats total every 2 years for all of the 25 colonies through which the roadway traverses, combined. Some road-kill may be offset as traffic on local roads decreases and shifts to the new interstate. Since Sections 1-3 are already in operation, and 5 and 6 consist of upgrading an existing four-lane state highway, impacts of this project to NLEBs from vehicular collision are anticipated to be less than typical new terrain roadways and these estimates are likely conservative.
- The maternity colonies and individual adult males have access to ample additional habitat nearby in the unlikely case that some individual bats should become displaced from their traditional foraging/roosting areas.
- I-69 may induce some amount of residential/commercial development in currently forested areas and may also speed up the rate of development that otherwise would have occurred within the action area at a slower rate, particularly in the immediate vicinity of

and within easy commuting distance of Section 5 and 6 interchanges (e.g. Liberty Church Interchange).

- Some harassment of bats roosting near construction areas may occur as a result of exposure to novel noises/vibrations/disturbance causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time. This will have only short term impacts, if any.
- Proposed forest, wetland, and stream mitigation within and near the maternity and hibernacula areas will ensure that over 5,500 acres of suitable roosting and foraging habitat persists in perpetuity, in addition to the permanent protection of several hibernacula known to support NLEBs during the non-maternity season.
- Long term reproduction and viability are not expected to be impacted by the project and all maternity colonies and hibernacula are likely to persist in the area.

Although there may be some short-term impacts to individuals within the colonies, these impacts are not likely to affect the colonies' long-term reproduction and viability. Thus, the maternity colonies are likely to persist within the action area into the reasonably foreseeable future following construction, operation, and maintenance of the I-69 project. Furthermore, with successful implementation and maturation of the proposed mitigation projects, permanent protection of several hibernacula, and other proposed mitigation and conservation measures, we anticipate that long-term habitat conditions for these colonies will be suitable and sustainable for the long-term survival and recovery of the species.

Table B1 in Appendix B deconstructs the Proposed Action and summarizes the anticipated direct and indirect environmental consequences and likely responses of exposed NLEBs.

V. CUMULATIVE EFFECTS

In the context of the Endangered Species Act, cumulative effects are defined as the effects of future State, tribal, local or private actions that are "reasonably certain" to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered because they require separate consultation pursuant to Section 7 of the Endangered Species Act (*e.g.*, new surface coal mining permits).

Reasonably foreseeable non-federal activities that are anticipated to occur within both the Summer and Winter Action Areas for the NLEB are planned development for residential subdivisions and commercial properties, legal drain maintenance, and timber harvest.

Regional Growth and Development

As previously mentioned, the Regional Economic Models, Inc. (REMI) model was used during the Tier 1 NEPA process to calculate the projected population and employment changes in each of five economic zones within the I-69 study area for the year 2030. Growth for each region was allocated into Traffic Analysis Zones (TAZs). Expert land use panels reviewed the REMI model results and either concurred with model results, or suggested adjustments based on their expectations of development. These panels consisted of developers, local city and county planning staff, and economic development personnel. Changes in land use were calculated for both the No Build and the Build conditions. The cumulative impacts are those forecasted to occur without the proposed I-69 construction (No-Build).

Cumulative forest cover impacts due to cumulative development ranged from 0 acres for Thousand Acre Woods, North Fork Prairie Creek, Smothers Creek, and White River – Weaver Ditch maternity colonies; <1-10 acres for 22 of the 38 maternity colonies; 11- 20 acres for 10 of the 38 maternity colonies; and 22 and 27 acres for Flat Creek and Beanblossom East maternity colonies respectively. All forest cover impacts resulting from cumulative impacts were less than or equal to 2% of the total forest cover available within the individual foraging areas. The majority were under 1%.

Forest cover impacts resulting from cumulative development for the entire WAA were estimated at 2,693 acres or 1% of the total forest cover available in the area. Forest cover impacts ranged from 26 acres for Cave to 1,566 acres and 1,581 acres for the Cave foraging area and the Cave foraging area, respectively. All forest cover impacts resulting from cumulative impacts ranged from <1% to 7% of the total forest cover available to the individual foraging areas. These impacts overlap most of the cumulative impacts discussed for the SAA and are not in addition to those described above.

There are numerous planned residential subdivisions in the Action Areas. Based on information from the Tier 1 Revised Programmatic BO for the Indiana bat, in 2006 there were approximately 100 plus planned and currently expanding subdivisions still being built within the Action Areas. The bulk of these developments are located in the northern portion of the Action Area just south of Indianapolis, in non-forested areas along SR 37.

In the Wabash Lowland Region (i.e., Vanderburgh, Warrick, Pike, Gibson and Daviess counties), forests were for the most part comprised of woodlots surrounded by farm fields. In addition, many of these are forested wetlands and/or in flood prone areas. The majority of the few subdivisions recorded were developed upon previously cleared lands, not forestlands.

In the heavily forested counties of Greene, Monroe, and Morgan, subdivisions were for the most part in developed lands with some exceptions. The major exceptions include the proposed Clifty Hills and Blue Ridge Estates in eastern Greene County and the Stonebridge Club along SR 37 in Morgan County. The development of such properties could potentially take many acres of forest. Other smaller planned subdivisions in Greene County are Lawrence Hollow Estates, Deer Lake, and Green Hills Estates South. These three subdivisions would take much less forested acres.

Monroe County and Morgan County have a number of subdivisions planned; however, many of these are near SR 37 in open lands surrounding the city of Bloomington. Examples of planned subdivisions in Monroe County are Farmers Field Acres, Rolling Glen Estates, Harrell Road Subdivision, and Orchard Estates in the vicinity of Hindustan. In Morgan County, a few examples of planned subdivisions are Turkey Knob, Country Club Woods, The Oaks and the Stonebridge Club. Most of the subdivisions located within the Action Areas take marginal acres of forestland.

Most of the planned subdivisions in the northern portion of the Action Area were found in open lands of the Tipton Till Plain within Marion County and Johnson County. Some examples of planned subdivisions in Marion County are Willingshire Community, Bluffs Subdivision, Bayberry Village, Silver Springs Subdivision, Governor's Pointe Subdivision, Ridgehill Trail Subdivision, and Thompson Meadows Subdivision. Examples in Johnson County are Shadowood, Woods at Somerset, Manor at Somerset, Persimmon Woods, and Northridge. Many of these subdivisions were located around existing subdivisions in the area and are part of the Indianapolis metropolitan area.

Legal Drains

In addition to indirect impacts generated by the REMI model, impacts to forest cover from possible legal drain dredging were estimated and added to the model-based cumulative impacts. These impacts could potentially occur regardless of the I-69 construction. Legal drains are those streams legally maintained by the county or maintained through privately funded groups and were identified through coordination with county engineers or representative director of Drainage Boards, Ditches and Levees for the various counties. The cumulative impacts to forest cover associated with the maintenance (*i.e.*, clearing of trees along streams) of legal drains was assessed by determining which legal drains support riparian tree habitat and estimating how much of it would likely be cleared in the next 20 years. Coordination with the county engineers and drainage board directors suggested that generally 1-2% of the legal drains have their forests cleared in 20 years. For this assessment a more liberal estimate of 5% clearing of forest cover along legal drains over the next 20 years was used to determine the legal drain maintenance forest loss component of the cumulative impact. This percentage was applied equally to all forest covered legal drains in each county. FHWA and INDOT concur that this approach is reasonable. Agricultural land impacts from legal drain maintenance were not included because they are temporary and land will likely remain in agricultural use. Legal drain maintenance impacts can be found in Appendix E and listed as part of the Cumulative Impacts in Table 19 of the NLEB BA.

Legal drains occur in the following 15 northern long-eared bat maternity colonies in order from south to north: Pigeon Creek South, Pigeon Creek North, Patoka South Fork, Robinson South, Robinson North, Flat Creek, East Fork White River, Aikman Creek, Thousand Acres Woods, North Fork Prairie Creek, Smothers Creek, White River - Weaver Ditch, White River – Fourmile Creek, Lambs Creek and Pleasant Run. For these colonies, forest cover impacts from potential legal drain maintenance make up the majority of the cumulative impacts to forest cover. Collectively, 49 acres of forest cover loss is estimated due to legal drain maintenance over the next 20 years.

The cumulative forest cover impacts (legal drain forest loss and REMI model cumulative loss) for all of the maternity colony areas are estimated at 213 acres.

Timber harvest

In the Tier 1 FEIS Cumulative Impacts (Chapter 5.26), it was found that the long-term pattern in Indiana forest loss, which began at least in 1800, began to level off in 1950. Appendix G of the Tier 1 FEIS shows that based on USDA data, forested acreages in southwestern Indiana have increased or remained relatively constant from 1950 (1,904,000 acres) to 1998 (2,026,500). The 38 maternity colonies are located primarily in Gibson, Pike, Daviess, Greene, Monroe, Morgan, and Johnson counties. From 1950 to 2013, forest acreage within the I-69 counties (Gibson, Pike, Daviess, Greene, Monroe, Morgan and Johnson) gradually increased from 461,000 acres to 550,896 acres (see Table 18 of the NLEB BA). Changing land management practices are contributing to this trend of increased forestation as some cropland and pasture are allowed to revert to forest and existing narrow wooded strips are allowed to expand. The increase in forested areas due to these changing practices has been greater than the losses from the conversion of forests to agriculture, urban/suburban expansion, and other uses in the past 50 years.

The following Indiana forest trends were highlighted within the North Central Research Station's 2005 report, "Indiana Forests: 1999-2003, Part A". A more recent report by the United States Forest Service entitled "Indiana's Forests 2008" confirms the trends listed below are still valid at the time of publishing (2011). Trends that we believe may be of a net benefit to NLEBs have been *italicized* below:

- *There are no major tree die-offs anywhere in the state; natural tree mortality appears evenly across the state.*
- *The ratio of harvested tree volume to tree volume growth indicates sustainable management*.
- *Diverse and abundant forest habitat (snags, coarse woody debris, forest cover and edges) support healthy wildlife populations across the state.*
- *Indiana possesses a diversity of standing dead tree wildlife habitat with an abundance of recently acquired snags to replenish fully decayed snags as Indiana's forests mature***.**
- Indiana's oak species continue to grow slower than other hardwood species.
- The average private forest landholding dropped from 22-acres in 1993 to 16-acres in 2003, indicating a continued "parcelization" of Indiana forests.
- Introduced or invasive plant species inhabit a majority of inventories plots.
- The amount of forest edge doubled from 1992 to 2001, indicating smaller forest plots.
- Due to land use history and natural factors, the forest soils of southern Indiana are generally below-average in quality.
- Although Indiana's overall forested land mass is increasing, the rate of increase has slowed over the past decade.
- *Indiana's forests continue to mature in terms of the number and size of trees within forest stands.*
- Increases in total volumes of oak species are less than those for most other hardwood species.
- The advanced ages and inadequate regeneration of Indiana's oak forests may signal a successional shift from an oak/hickory-dominated landscape to one where other hardwood species, such as maples, occupy more forested areas.
- Indiana's hardwood saw-timber resource continues to be at risk due to maturing of hardwood stands, loss of timberland to development and new pests (gypsy moth, emerald ash-borer, sudden oak death, beech-bark disease, and more).
- Ownerships of Indiana forests have changed in the past decade, resulting in more parcelization and fragmentation.

While the data shows there has been loss of continuous forest, resulting in smaller, fragmented stands, there is also an overall increase in forested land across the state.

Timbering appears to be limited and sporadic in the Action Areas. Observations throughout many years indicate that cutting is for the most part selective and that much of the timber in the area is second growth indicating past activities. Classified forests are common and many in the Action Areas and allow for the management of timber, especially selective cutting.

VI. CONCLUSION

Our non-jeopardy conclusions regarding impacts to the eastern fanshell mussel (*Cyprogenia stegaria*) and the Indiana bat (*Myotis sodalis*) still stand as stated in the original December 3, 2003 BO and the amended 2006 Revised Programmatic BO, respectively. In addition, all previous Tier 2 Biological Opinions for these species remain valid.

After reviewing the current status of the NLEB, the environmental baseline for the action areas, the aggregate effects of the proposed construction, operation, and maintenance of the interstate and associated development, and the cumulative effects, **it is the Service's conference opinion that the I-69 interstate project, from Evansville to Indianapolis, as proposed, is not likely to jeopardize the continued existence of the northern long-eared bat (M*yotis septentrionalis*). No Critical Habitat has been designated for this species.**

Our basis for this conclusion follows:

- Because construction of I-69 in Sections 1-3 is completed, Section 4 (and part of 5) is already cleared, and Sections 5 and 6 consist primarily of upgrading an existing four-lane facility, we believe impacts to the existing colonies should be minimal. Much of the tree-clearing work in Sections 5 and 6 will be performed within existing right of way and any colonies in this area have co-existed with the current roadway.
- Coordination with landowners along the right of way regarding Indiana bat and NLEB presence and tree clearing restrictions, in conjunction with a new conservation measure to encourage landowners to limit the timing of clearing, should avoid and minimize impacts to bats.
- Because I-69 will have a long narrow/linear footprint, the amount of adverse impacts to any one habitat patch or maternity area along its path is minimal when compared to impacts of a similarly sized area that has a non-linear configuration.
- We anticipate very few NLEBs may be taken during the summer maternity season as a result of road-kill (no more than approximately 7 bats total every 2 years for all of the 25 colonies through which the roadway traverses, combined). Some small amount of males during the summer may be taken, as well as some bats in the WAA during the fall, winter and spring. We anticipate these numbers to be insignificant.
- Based on an abundance of surrounding forested habitat, we do not anticipate that any of the 38 maternity colonies will be permanently displaced by direct or indirect effects associated with the construction, operation, and maintenance of the I-69 project.

- The currently proposed 5,528 acres of forest mitigation (including landlocked parcels) and nearly 240 acres of wetland mitigation has been strategically located to improve upon the existing high-quality habitat within and near the various NLEB and Indiana bat maternity colony areas and hibernacula; therefore, we believe adverse impacts to the colonies and any adult males occurring in the immediate area will be further minimized and should not be long lasting. Because of the commitment to restore and permanently protect thousands of acres of forest and wetland habitat, the maternity colonies within the project action area will experience a net gain in habitat as part of the Proposed Action and receive both short and long-term benefits that will continue in perpetuity. In the unlikely event all of the proposed mitigation areas completely fail, the maternity colonies are still likely to persist within the other available habitat within their traditional summer range.
- We do not anticipate any long-term, significant impacts to the local population of NLEBs nor the species within its entire range due to the proposed project.
- A permanent conservation easement has recently been placed on the third and fourth largest Indiana bat hibernacula in the state (Caves), which is also known to be used by the NLEB; protection of these hibernacula and several others will be very important for the long term protection and recovery of myotids. Specifically, permanent protection of local hibernaculum will reduce the estimated take due to vandalism and human disturbance. Furthermore, permanent protection of the caves and their surrounding forests will provide long-lasting protection for essential fall swarming habitat for bats that use these caves and eliminate future possibilities for these properties to be developed.

Based on our analysis, we do not believe that the proposed action "would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the northern long-eared bat by reducing the reproduction, numbers, or distribution of the northern long-eared bat (50 CFR 402)." For the proposed action to "reduce appreciably" the NLEBs survival and recovery, the proposed action would have to impede or stop the process by which the NLEB's ecosystems are restored and/or threats to the NLEB are removed so that self-sustaining and self-regulating populations can be supported as persistent members of native biotic communities (USFWS and NMFS 1998, page 4-35). We do not believe the proposed project impedes or stops the survival and recovery process for the NLEB bat because:

> We believe that the proposed roadway construction, operations, and maintenance, while potentially resulting in the incidental take of some individuals, are not a significant threat to the species in the Midwest population, nor the species as a whole and, therefore, do not rise to the level of jeopardy. No component of the proposed action is expected to result in harm, harassment, or mortality at a level that would reduce appreciably the reproduction, numbers, or distribution of the northern long-eared bat.

This concludes the conference for the northern long-eared bat on the I-69 Evansville to Indianapolis, Indiana Interstate project. Based on the timing of the completion of this conference opinion and the effective listing date of May 4, 2015, this conference opinion will automatically be adopted as a biological opinion upon the listing date and no further section 7 consultation will be necessary. The incidental take statement provided in this conference opinion will become effective once the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation.

After listing of the northern long-eared bat as threatened and the subsequent adoption of this conference opinion as the biological opinion, the Federal agency shall request re-initiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are **non-discretionary**, and must be undertaken by the FHWA or their designee (*e.g.*, INDOT) for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

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

AMOUNT OR EXTENT OF TAKE

The Service believes it is likely that incidental take of northern long-eared bats in the I-69 action area will occur as a direct or indirect result of the Proposed Action in the following forms:

- Harm through habitat modification/permanent direct loss of roosting habitat/ alternate roost tree(s) and loss of foraging habitat and connectivity/travel corridors among forested patches in the action area, primarily in Sections 5 and 6 where tree clearing activities are still ongoing,
- Harass/wound/kill/harm from disturbance and habitat loss associated w/demolition and subsequent relocation of homes and businesses in the action area,
- Harass/harm from permanent habitat loss from I-69 related utility relocations,

- Death/kill from direct collision with vehicles traveling at high speeds (*i.e.*, road-kill) on I-69 and/or increased traffic volumes on other local roadways,
- Harassment of bats roosting near construction and/or operation of I-69 from noises/vibrations/disturbance levels causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time (most likely to occur in Section 4 where new terrain construction is underway, as well as Sections 5 and 6).

Based on our analysis, the Service believes 38 northern long-eared bat maternity colonies occur within the Expanded SAA. Adverse effects on the colonies include habitat loss/modification, short term noise/disturbance, and loss of individuals from road-kill. Although very difficult to predict, we estimated the maximum amount of I-69 related incidental take for all 38 maternity colonies combined from all sources within the Action Area to be no more than 90 individuals (55 from road-kill, 20 from noise/vibration during construction, and an additional 15 adult females/juveniles as a result of habitat loss/modification and/or disturbance) during the next 16 years of construction and operation (approximately 2014-2030). Additionally, we expect a small, unknown number of male bats to be taken during the summer months, primarily as a result of road-kill. No significant, long-term adverse effects are anticipated to accrue to any of the maternity colonies, nor to any local populations of adult males. It is also possible that some small amount of take could occur during the fall, winter, and spring time period as a result of roadkill, habitat loss (this amount is very low), disturbance during hibernation (construction noise and vibrations), and increased human visitation to area caves. The number of northern long-eared bats using the various hibernacula is not known at this time, but we expect the number of bats affected to be insignificant and discountable.

It is unlikely that direct mortality of small-sized bats from road-kill will be detected, that is, we do not expect that most dead or moribund bats are likely to be found. The same is true for take associated with habitat modification/loss and disturbance; detecting or finding dead individuals is unlikely. However, because it is not practical to quantify take of northern long-eared bats at the individual level, we can track the level of anticipated take by monitoring the amount of habitat modification as a surrogate. The Proposed Action will result in the direct loss of up to 486 forested acres in the I-69 project action area. The Service anticipates that reproductive and viability consequences at the maternity colony level are not likely to occur with the proposed amount of habitat modification. If the amount of habitat modification exceeds the specified levels, the trigger for re-initiation has been met. The specified level of habitat modification which triggers re-initiation is defined as exceeding the anticipated project-wide 486, section-specific, or hibernacula-specific habitat acreages or annual number of roadkilled bats by more than 10%. Furthermore, the FHWA will keep track of any known northern long-eared bat road-kills to ensure that the anticipated amount of incidental take is not exceeded.

The anticipated level of adverse impacts to northern long-eared bat forested habitat includes impacts planned to take place this winter in Section 5. It is expected that these impacts will occur prior to the species being listed, in which case the actual amount of take will be reduced from the current estimates by the time this conference opinion is adopted as a biological opinion. If the remainder of Section 5 is cleared this winter (172 acres), then the estimated forested habitat loss for the species once it is listed will be approximately 314 acres (the amount of estimated clearing in the final section, Section 6).

Anticipated direct forest acreage impacts for the remaining I69 construction in Sections 5 and 6:

Section 5 (if not cleared in 2015)	**Section 6**
172 acres	314 acres

Anticipated direct forest impacts to presumed NLEB hibernacula:

Hibernacula	**Acres of forest**
	0
	<1
	<1
	2
	<1
	0
	0
	0
	2
	<1
	0
	2
	0
	0
	0
	0
	<1
	0
	<1
	0
	2
	<1
	<1
	0
	0
	38
	3
	17
	0
	<1
	0
	0
	0
	0

	0
	<1
	0
	0
	0
	0
	<1
	0
	0
	0
	0
	3
	0
	0
	0
	0
	0
	0
	3
	0
	<1

EFFECT OF THE TAKE

In the accompanying conference opinion, the Service determined that the aggregate level of anticipated take is not likely to result in jeopardy to the Indiana bat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of northern long-eared bats:

1. In the NLEB BA, the FHWA proposed to investigate and/or implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of wildlife species, including northern long-eared bats. The Service will take the necessary steps to ensure that the FHWA successfully implements all the conservation measures to the fullest extent practicable.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

3. All I-69 construction personnel and INDOT maintenance staff need to be made aware of potential issues concerning northern long-eared bats and construction and maintenance of I-69.

4. The FHWA needs to ensure that the impacts of take associated with future Tier 2 section-specific actions (i.e. Section 6) are appropriately minimized and that the exemption of incidental take is appropriately documented and anticipated levels of incidental take will not be exceeded nor will any new forms of take occur that were not anticipated in the CO.

5. The FHWA will avoid direct take of roosting northern long-eared bats, including as a result of building relocations and demolitions, and bridge work in the action area.

The Service believes that the measures above are necessary, appropriate, and reasonable for minimizing take of northern long-eared bats.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA (and/or INDOT and their contractors or assigns) must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. The FHWA must implement all proposed mitigation and conservation measures, as detailed in the revised "Tier 1 Forest and Wetland Mitigation and Enhancement Plan" and "Conservation Measures for Impacts to Threatened and Endangered Species" sections of the 2006 Tier 1 BA Addendum, as updated for the northern long-eared bat (see page 7 of the NLEB BA) or alternative measures that are of equal or greater benefit to northern long-eared bats as developed in consultation with the Service during Tier 2.

2. FHWA will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service's BFO by 31 January each year (the first report will be due 1/31/16) and reporting will continue for at least 5 years post-construction or until otherwise agreed to with the Service.

   If proposed conservation measures or mitigation goals cannot be realized (e.g., lack of willing-sellers), then FHWA will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to northern long-eared bats within the Summer and Winter Action Areas.

3. All I-69 engineering supervisors, equipment operators, and other construction personnel and INDOT (and/or concessionaire) maintenance staff will attend a mandatory environmental awareness training that discloses where known sensitive northern long-eared bat sites are located in the project area, addresses any other concerns regarding northern long-eared bats, and presents a protocol for reporting the presence of any live,

injured, or dead bats observed or found within or near the construction limits or right-of-way during construction, operation, and maintenance of I-69.

4. Bridges and culverts over 60 inches in vertical height or rise should be inspected for the presence of bats within seven days of the start of construction activity on that bridge or culvert that will take place between April 1 and September 30. Inspection consists of examining the underside of each bridge or the ceiling of each culvert for the presence of bats. If any bats are found roosting on the bridge or culvert, immediately contact our office at (812) 334-4261 to determine the appropriate response.

5. Bats may use man-made structures as roosts to shelter their pups, which are not be able to fly when they are very young. Therefore, during the maternity season, in May, June, and July, buildings should be visually inspected prior to demolition to determine whether bats are present. Should bats be found using the building, contact our office at (812) 334-4261 to determine the appropriate response.

6. To ensure the appropriate evaluations are completed during field efforts associated with Terms and Conditions numbers 4 and 5 above, INDOT and FHWA will prepare specific protocols for inspecting bridges, culverts and structures for review and approval by USFWS prior to initiation of any activities associated with modification of existing bridges and culverts or demolition of existing structures.

7. To ensure that the impacts of take associated with future Tier 2 section-specific actions are appropriately minimized and that the exemption of incidental take is appropriately documented, the FHWA and the U.S. Fish and Wildlife Service have implemented a tiered consultation approach for I-69. Under this approach, the Tier 1 Revised Programmatic Biological Opinion and Incidental Take Statement (of which the accompanying NLEB Conference Opinion and Incidental Take Statement are an addendum of) will exempt incidental take that results from the implementation of site-specific actions of the proposed action as detailed in the NLEB BA. This exemption of incidental take shall currently apply to the Tier 2 Sections in operation or actively under construction (i.e. Sections 1, 2, 3, 4 and 5) as long as the impacts remain consistent with those presented in the NLEB BA and the Terms and Conditions of this Conference Opinion. This exemption will continue to apply unless there is a change that would require reinitiation (i.e. new information becomes available or a substantial project change occurs that would exceed the habitat impact or incidental take allowance). However, specific impacts within the future Section 6 Tier 2 project must be individually reviewed by the Service to determine if they are consistent with this Incidental Take Statement's reasonable and prudent measures and associated terms and conditions, and to ensure that site-specific impacts and the resulting incidental take are minimized. If effects of the individual Section 6 Tier 2 project are found to be consistent with those analyzed in the Section 7 consultation and this conference, then it will be approved in a Tier 2 Biological Opinion and Incidental Take Statement, along with any additional section-specific reasonable and prudent measures and terms and conditions that are needed to fulfill the requirements of section 7(a)(2). No incidental take for Section 6 shall be exempted until after the Section 6 Tier 2 BA has been reviewed, found

to be complete and consistent with Tier 1 findings, and has been approved in a Section 6 Tier 2 BO by the Service.

Because acreages of lost northern long-eared bat habitat are being used as a surrogate to monitor levels of incidental take within the entire Summer and Winter Action Areas, as well as within each Tier 2 project section and 5-mile radius around each known hibernaculum, the FHWA will provide the Service's Bloomington Field Office with a detailed description of each project section's contribution to habitat loss by preparing a Tier 2 Biological Assessment for each project section (this has already been done for Sections 1, 2, 3, 4 and 5). The Tier 2 Biological Assessments must include (where applicable): maps of the preferred final alignment and all associated development; methods and results of Tier 2 mist net surveys, radio-tracking studies, roost tree emergence counts, and hibernacula surveys; exact locations of all known and newly discovered northern long-eared bat roost trees and hibernacula (hibernacula location maps must identify known hydrologically connected surface streams and sinkholes and their drainage basins and delineate approximate boundaries of potential recharge areas for each hibernaculum within the WAA in relation to I-69's direct and indirect impacts as identified during Tier 2 and previous studies); the total acreages and relative quality of forest (e.g., maturity of forest/estimated dbh of live canopy trees and estimated suitability for roosting/estimated number and dbh of snags) and wetland habitats that will be directly impacted and permanently cleared/filled; and all other anticipated project section-specific impacts. Tier 2 BAs must also describe any additional direct or indirect effects that were not considered during the Tier 1 programmatic-level consultation and conferencing. To reduce redundancy, Tier 2 BAs should summarize or simply reference sections of the Tier 1 BAs that would otherwise be repetitive.

The Tier 2 BA must quantify how the individual Tier 2 Section's direct impact acres contribute to the estimated section-specific and hibernacula-specific acres as well as to the project-wide forest acres (486 acres of forest impact estimated for the NLEB) as specified in the AMOUNT OR EXTENT OF TAKE section above. The Tier 2 BA should also report how much total acreage remains for the overall I-69 project and within each project section in the SAA and hibernacula in the WAA (*i.e.*, provide the running totals and the remaining balances for these exempted levels of take).

FHWA's cover letters requesting section-specific ESA Section 7 reviews must include a determination of whether or not the proposed project is consistent with the Programmatic Biological Opinion and Incidental Take Statement (and accompanying NLEB Conference Opinion and Incidental Take Statement) and request that the proposed Tier 2 BA be appended to the Programmatic Biological Opinion. The cover letter, and one bound hard copy and an electronic copy of the Tier 2 BA should be submitted to the BFO when requesting a project section review.

8. Any dead bats located within the construction limits, right-of-way, rest stops, or mitigation areas of I-69, regardless of species, should be immediately reported to BFO [(812) 334-4261], and subsequently transported (frozen or on ice) to BFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear

to be sick or injured to BFO. BFO will make a species determination on any dead or moribund bats. If a northern long-eared bat is identified, BFO will contact the appropriate Service Law Enforcement office as required.

The FHWA will keep track of all known northern long-eared bats killed from vehicle collisions to ensure that the anticipated amount of incidental take, approximately 7 killed every two years (55 total through year 2030), is not exceeded.

ATTENTION: If at any point in time during this project, the exempted project-wide or section-specific habitat acreages or annual number of roadkilled bats quantified in the AMOUNT OR EXTENT OF TAKE section of this ITS are exceeded by more than 10%, then the Service will assume that the exempted level of take for this project may have been exceeded and the FHWA should immediately reinitiate formal consultation.

In conclusion, the Service believes that the permanent loss of currently suitable summer roosting and foraging habitat for northern long-eared bats will be limited to 486 acres of forest within the SAA (SAA) and 38 acres of forest habitat within the Winter Action Area (WAA). These acreages represent approximately a <1% loss of the SAA's forested acreage and a <1% loss of the WAA's forested acreage and will occur over a period of at least several years. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded (or tree clearing occurs during the period April 15-September 15 in the SAA or April 1-November 15 within the WAA any given year) such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action/program on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations generally do not focus on a specific project, but rather on an agency's overall program.

The Service provides the following conservation recommendations for the FHWA's consideration; these activities may be conducted at the discretion of FHWA as time and funding allow:

NORTHERN LONG-EARED BAT CONSERVATION RECOMMENDATIONS

1. Working with the Service, develop national guidelines or best management practices for addressing northern long-eared bat issues associated with FHWA projects within the

range of the northern long-eared bat, including measures to avoid and minimize private landowner impacts to the species prior to state and/or federal acquisition.

2. Provide funding to expand on scientific research and educational outreach efforts on northern long-eared bats in coordination with the Service's BFO.

3. In coordination with the BFO, purchase or otherwise protect additional northern long-eared bat hibernacula and forested swarming habitat in Indiana.

4. Provide funding for research to address White Nose Syndrome in bats.

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

REINITIATION NOTICE

This concludes formal consultation for the northern long-eared bat with FHWA on the construction, operation, and maintenance of the I-69 from Evansville to Indianapolis, Indiana and associated development. As provided in 50 CFR §402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action (e.g., highway construction and associated development) are subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

Literature Cited

Adams, R. A. and M. A. Hayes. 2008. Water availability and successful lactation by bats as related to climate change in arid regions of western North America. Journal of Animal Ecology 77: 1115-1121.

Amelon, S., and D. Burhans. 2006. Conservation assessment: *Myotis septentrionalis* (northern long-eared bat) in the eastern United States. Pages 69-82 in Thompson, F. R., III, editor. Conservation assessments for five forest bat species in the eastern United States. U.S. Department of Agriculture, Forest Service, North Central Research Station, General Technical Report NC-260. St. Paul, Minnesota. 82 pp.

Arnold, B. 2007. Population structure and sex-biased dispersal in the forest dwelling vespertilionid bat, *Myotis septentrionalis*. Am. Midl. Nat. 157:374–384.

Bale, J. S., G. J. Masters, I. D. Hodkinson, C. Awmak, T. M. Bezemer, V. K. Brown, J. Butterfield, A. Buse, J. C. Coulson, J. Farrar, J. E. Good, R. Harrington, S. Hartley, T. Hefin Jones, R. L. Lindroth, M. C. Press, I. Symrnioudis, A. D. Watt, J. B. Whittaker. 2002. Herbivory in global climate change research: direct effects of rising temperature on insect herbivores. Global Change Biology 8:1-16.

Barbour, R. W. and W. H. Davis. 1969. Bats of America. The University of Kentucky Press, Lexington, Kentucky.
64

Brack, V. 2007. Temperatures and Locations Used by Hibernating Bats, Including *Myotis sodalis* (Indiana Bat), in a Limestone Mine: Implications for Conservation and Management. Journal of Environmental Management 40:739–746.

Brack, V., and J. O. Whitaker. 2001. Foods of the northern myotis,*Myotis septentrionalis,* from Missouri and Indiana, with notes on foraging. *Acta Chiropterol.* 3: 203–210.

Brack, V., Jr. 1983. The non-hibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Ph.D. dissertation, Purdue Univ., West Lafayette, Ind. 280 pp.

Broders, H.G., Forbes, G.J., Woodley, S., Thompson, I.D., 2006. Range extent and stand selection for roosting and foraging in forest-dwelling northern long-eared bats and little brown bats in the Greater Fundy ecosystem, New Brunswick. J. Wildl. Manage. 70, 1174–1184.

Butchkowski, C. M. 2003. Indiana Bat (*Myotis sodalis*) Investigations at Canoe Creek, Blair County Pennsylvania. Report to Pennsylvania Game Commission, Bureau of Wildlife Management. 13 pp.

Caceres, M. C., and M. J. Pybus. 1997. Status of the northern long-eared bat (*Myotis septentrionalis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 3, Edmonton, AB.

Caceres, M. C., and R. M. R. Barclay. 2000. *MYOTIS SEPTENTRIONALIS*. Mammalian Species No. 634:1-4.

Caire, W., R. K. LaVal, M. L. LaVal, and R. Clawson. 1979. Notes on the ecology of *MYOTIS KEENII* (Chiroptera, Vespertilionidae) in Eastern Missouri. Amer. Midl. Nat. 102(2):404-407.

Callahan, E.V., III. 1993. Indiana bat summer habitat requirements. M.S. Thesis. University of Missouri, Columbia. 84 pp.

Carter, Timothy C. and G. Feldhamer. 2005. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. Forest Ecology and Management 219: 259–268.

Clark, B.K, Bowles, J.B. and B.S. Clark. 1987. Status of the endangered Indiana bat in Iowa. American Midland Naturalist, 118(1): 32-39.

Cope, J.B. and S.R. Humphrey. 1972. Reproduction of the bats *MYOTIS KEENII* and *PIPISTRELLUS SUBFLAVUS* in Indiana. 13:9-10.

Dickinson, M.B., Norris, J.C., Bova, A.S., Kremens, R.L., Young, V. and M.J. Lacki. 2010. Effects of wildland fire smoke on a tree-roosting bat: integrating a plume model, field measurements, and mammalian dose–response relationships. Can. J. For. Res. 40: 2187–2203.

Easterla, D. A. 1968. Parturition of Keen's Myotis in Southwestern Missouri. Journal of Mammalogy 49(4):770.

Faure, P. A., J. H. Fullard, J. W. Dawson. 1993. The gleaning attacks of the Northern long-eared bat, Myotis septentrionalis, are relatively inaudible to moths. Journal of Experimental Biology 178:173-189.

Feldhamer, G. A., T. C. Carter, J. O. Whitaker Jr. 2009. Prey Consumed by Eight Species of 5 Insectivorous Bats from Southern Illinois. The American Midland Naturalist 162(1):43-51.

Fitch, J. H. and K. A. Shump, Jr. 1979. Myotis keenii. Mammalian Species, No. 121:1-3.
Fobian, T. B. 2007. Reproductive biology of the rabbitsfoot mussel (Quadrula cylindrica) (Say, 1817) in the upper Arkansas River system, White River system, and the Red River system. Unpublished M.S. thesis, Missouri State University, Springfield. 104 pp.

Foster, R. W. and A. Kurta. 1999. Roosting ecology of the Northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80(2):659-672.

Garner, J. D., and J. E. Gardner. 1992. Determination of summer distribution and habitat utilization of the Indiana bat (Myotis sodalis) in Illinois. Final Report. Project E-3. Illinois Department of Conservation, Division of Natural Heritage and Illinois Natural History Survey, Center for Biogeographic Information. 25 pp.

Garroway, C. J. and H. G. Broders. 2008. Day roost characteristics of northern long-eared bats (*Myotis septentrionalis*) in relation to female reproductive status. Ecoscience 15(1):89-93.

Garroway, C.J., Broders, H.G., 2007. Nonrandom association patterns at northern long-eared bat maternity roosts. Can. J. Zool. 85, 956–964.

Goehring, H. H. 1954. *Pipistrellus subflavus obscurus, Myotis keenii*, and *Eptesicus fuscus fuscus* hibernating in a storm sewer in central Minnesota. Journal of Mammalogy 35(3):434-436.

Griffin, D. R. 1940. Reviewed notes on the life histories of New England cave bats. Journal of Mammalogy 21(2):181-187.

Griffin, D. R. 1945. Travels of banded cave bats. Journal of Mammalogy 26(1): 15-23.
Griffith, L. A. and J. E. Gates. 1985. Food habits of cave-dwelling bats in the central Appalachians. Journal of Mammalogy 66(3):451-460.

Hall, J. S., R. J. Cloutier and D. R. Griffin. 1957. Longevity records and notes on tooth wear of bats. Journal of Mammalogy 38 (3): 407-409.

Hitchcock, H. B. 1949. Hibernation of bats in southeastern Ontario and adjacent Quebec. Canadian Field-Naturalist 63(2): 47-59.

IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Johnson, J. B., W. M. Ford, J. W. Edwards. 2011. Nocturnal activity patterns of northern myotis (*Myotis septentrionalis*) during the maternity season in West Virginia (USA). Acta Chiropterologica, 13(2): 391–397.

Johnson, J. B., W. M. Ford, J. W. Edwards. 2012. Roost networks of northern myotis (*Myotis septentrionalis*) in a managed landscape. Forest Ecology and Management 266: 223–231.

Jones, G., D. S. Jacobs, T. H. Kunz, M. R. Willig, P. A. Racey. 2009. Carpe noctem: the importance of bats as bioindicators. Endangered Species Research 8: 93–115.

King, A. 1993. A Model of Summer Habitat Use by the Federally Endangered Indiana Bat (*Myotis sodalis*) in Indiana: Compilation of Data from 1990-1992 Field Studies. 3D/Environmental Services Inc., Cincinnati, Ohio. Unpublished Technical Report submitted to the Indiana Department of Natural Resources, Division of Fish and Wildlife, Endangered Species Program.

Krochmal, A. R. and D. W. Sparks. 2007. Timing of Birth and Estimation of Age of Juvenile *Myotis septentrionalis* and *Myotis lucifugus* in West-Central Indiana. Journal of Mammalogy 88(3):649-656.

Kunz, T. H. 1971. Reproduction of Some Vespertilionid Bats in Central Iowa. American Midland Naturalist 86(2):477-486.

Kunz, T. H. 1973. Temporal and Spatial Components of Bat Activity in Central Iowa. Journal of Mammalogy 54(1):14-32.

Kurta, A. 1995. Mammals of the great lakes region. Ann Arbor: University of Michigan Press.

Kurta, A. and J. A. Teramino. 1994. A novel hibernaculum and noteworthy records of the Indiana bat and eastern pipistrelle (Chiroptera: Vespertilionidae). American Midland Naturalist 132(2):410-413.

Kurta, A. 1982. A review of Michigan Bats: Seasonal and Geographic Distribution. Michigan Academician 14:295-311.

Lacki, M. J., D.R. Cox, L. E. Dodd, and M. B. Dickinson. 2009. Response of northern bats (*Myotis septentrionalis*) to prescribed fires in eastern Kentucky forests. Journal of Mammalogy 90(5): 1165-1175.

Lacki, M. J. and J. H. Schwierjohann. 2001. Day-Roost Characteristics of Northern Bats in Mixed Mesophytic Forest. The Journal of Wildlife Management 65(3):482-488.

LaVal, R. K., R. L. Clawson, M. L. LaVal and W. Caire. 1977. Foraging Behavior and Nocturnal Activity Patterns of Missouri Bats, with Emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis.* Journal of Mammalogy 58(4):592-599.

Menzel, M. A., S. F. Owen, W. M. Ford, J. W. Edwards, P. B. Wood, B. R.Chapman, and K. V. Miller. 2002. Roost tree selection by northern long-eared bat (*Myotis septentrionalis*) maternity colonies in an industrial forest of the central Appalachian mountains. Forest Ecology and Management 155:107-114.

Menzel, M.A., J.M. Menzel, T.C. Carter, W.M. Ford, J.W. Edwards. 2001. Review of the forest habitat relationships of the Indiana bat (*Myotis sodalis*). USDA Forest Service, Pennsylvania.

Mills, R. S. 1971. A concentration of *Myotis keenii* at caves in Ohio. Journal of Mammalogy. 52(3) 625 pp.

Mumford R. E., and J. B. Cope. 1964. Distribution and status of the chiroptera of Indiana. American Midland Naturalist 72(2):473-489.

Nagorsen, D. W., and R. M. Brigham. 1993. The Mammals of British Columbia. 1. Bats. Royal British Columbia Museum, Victoria, and the University of British Columbia Press, Vancouver. pp. 164.

Owen, S. F., M. A. Menzel, W. M. Ford, B. R. Chapman, K. V. Miller, J. W. Edwards, and P. B. Wood. 2003. Home-range size and habitat used by the Northern Myotis (*Myotis septentrionalis*). American Midland Naturalist 150(2):352-359.

Owen, S. F., M. A. Menzel, W. M. Ford, J. W. Edwards, B. R. Chapman, K. V. Miller, and P. B. Wood. 2002. Roost tree selection by maternal colonies of Northern long-eared Myotis in an intensively managed forest. USDA Forest Service. Newtown Square, Pennsylvania.

Pearson, E. W. 1962. Bats hibernating in silica mines in southern Illinois. Journal of Mammalogy 43(1):27-33.

Perry, R. W., and R. E. Thill. 2007. Roost selection by male and female northern longeared bats in a pine-dominated landscape. Forest Ecology and Management 247:220-226.

Raesly, R. L. and J. E. Gates. 1987. Winter habitat selection by north temperate cave bats. American Midland Naturalist 118(1):15-31.

Sasse, D.B. and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (Myotis septentrionalis) in the white mountain national forest. Bats and Forests Symposium October 1995, Victoria, British Columbia, Canada, p.91-101.

Sheets, J. Whitaker, John O., Brack Jr., Virgil W., Sparks, Dale W. 2013. Bats of the hardwood ecosystem experiment before timber harvest: assessment and prognosis. Gen. Tech. Rep. NRS-P-108. U.S. Department of Agriculture, Forest Service, Northern Research Station.

Simmons, N.B. 2005. Mammal species of the world: a taxonomic and geographic reference. P.516. [Wilson, D.E. and D.M. Reeder (editors)]. The John Hopkins University Press, Baltimore, Maryland.

Stones, R.C. and W. Fritz. 1969. Bat studies in upper Michigan's copper mining district. The Michigan Academician, p. 77-85.

Swanson, G. and C. Evans. 1936. The hibernation of certain bats in southern Minnesota. Journal of Mammalogy, 17(1): 39-43.

Timpone, J. C., Boyles, J.G., Murray, K.L., Aubrey, D.P., and L.W. Robbins. 2010. Overlap in roosting habits of Indiana Bats (Myotis sodalis) and northern bats (Myotis septentrionalis). American Midland Naturalist, 163:115-123.

U.S. Fish and Wildlife Service (USFWS). 2002. Biological Opinion on the Application for an Incidental Take Permit for the Federally Endangered Indiana Bat (*Myotis sodalis*) for the Six Points Road Interchange and Associated Development. Unpublished Report. Bloomington Field Office, Bloomington, Indiana. 35 pp.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered species handbook – procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. Washington, D.C.

van Zyll de Jong, C.G. 1979. Distribution and systematic relationships of long-eared Myotis in western Canada. Canadian Journal of Zoology, 57: 987-994.

van Zyll de Jong, C. G. 1985. Handbook of Canadian mammals. National Museums of Canada, Ottawa, Canada. pp. 116-120.

Whitaker, J.O. and W.J. Hamilton. 1998. Mouse-eared bats, Vespertilionidae. P. 89-102. In Mammals of the eastern United States, Third Edition. Comstock Publishing Associates, a Division of Cornell University Press, Ithaca, New York.

Whitaker, J.O. and R.E. Mumford. 2009. Northern Myotis. P. 207-214. In Mammals of Indiana. Indiana University Press, Bloomington, Indiana.

Whitaker, J.O. and L.J. Rissler. 1992. Seasonal activity of bats at copperhead cave. Proceedings 17 of the Indiana Academy of Science, 101: 127-134.

Zurcher, A. A., D. W. Sparks, and V. J. Bennett. 2010. Why the bat did not cross the road. Acta Chiropterologica, 12(2): 337–340.

Appendix A

I-69 Conservation Measures

The following conservation measures were jointly developed by the FHWA, INDOT, and the Service during informal consultation as part of the Tier 1 study and were subsequently incorporated into the Tier 1 BA as part of the proposed action. These measures were specifically designed to avoid and minimize impacts of the proposed action on Indiana bats and to further their recovery, **and because of similarities between the species are hereby offered for the northern long-eared bat.** In the original Tier 1 BO (dated December 3, 2003), the Service analyzed the effects of the proposed action based on the assumption that all conservation measures would be implemented or equivalent measures developed in consultation with the Service during Tier 2. The beneficial effects of the following measures were taken into consideration for both jeopardy and incidental take analyses.

Since the development of the Tier 1 BA, FHWA and INDOT have generated additional information for the northern long-eared bat. Therefore, the following conservation measures are provided along with any suggested revisions in this Tier 1 BA Addendum. A status report is provided for reference.

It is important to note that those conservation measures developed for the bald eagle and eastern fanshell mussel in the original Tier 1 BA remain valid although they are not listed below.

Conservation measures below for the northern long-eared bat have been added to those of the Indiana bat measures reported in the Tier 1 BA Addendum dated March 7, 2006. Due to similarities in the two species, FHWA and INDOT consider conservation measures suitable for the Indiana bat to be similarly suitable for the northern long-eared bat.

A. CONTEXT SENSITIVE SOLUTIONS

1. *WINTER HABITAT*

   a. **Alignment Planning –** Efforts will be made to locate Interstate alignments beyond 0.5 mile from known Indiana bat hibernacula.

Status – Completed for Indiana bat. All alternatives are 0.5 mile or more from an existing Indiana bat hibernacula. The road has been built in Sections 1-3.

The Preferred Alternative in Sections 4 and 5 show six northern long-eared bat hibernacula within 0.5 mile. Five of these caves are in Section 4 with Cave in the lower portion of Section 5 along SR 37. Tree clearing in Sections 1-4 is completed. Tree clearing in Section 5 was completed for most utilities and southern portions of the right-of-way as of April 1, 2014. Tree clearing for the remainder of the right-of-way in Section 5 is proposed from October 15, 2014 to March 31, 2015.

Northern long-eared bat hibernacula within 0.5 miles of the roadway are

Approximate distances of these caves from existing cleared right-of-way are:

Cave Name	**Distance to Right-of-Way (miles)**
	0.3

0.4
0.3
0.1
0.5
0.3

The WAA for the northern long-eared bat is within Greene, Monroe, Lawrence and Owen counties. There are 60 known hibernacula for the northern long-eared bat in these four counties. Fifty-five hibernacula are within 5 miles of the Preferred Alternative and thus comprise the WAA. Hibernacula for this species include caves that showed northern long-eared bats hibernating in the cave and/or those that have had northern long-eared bats harp trapped at cave entrances.

Hibernacula for the northern long-eared bat are:

Numbers (in parentheses) come from I-69 data and indicate the number of northern long-eared bats harp trapped at their entrance and/or observed in a winter cave survey, while "IDNR winter cave survey" indicate their winter occurrence in caves (USFWS data). A total of 1,030 northern long-eared bats have been recorded from 50 caves reviewed in I-69 surveys. The northern long-eared bat was the most common species harp trapped in this project.

b. **Blasting** – All efforts will be made to avoid blasting between September 15 and April 15 in areas within 0.5 mile of known northern long-eared bat hibernacula. All blasting in the WAA will follow the specifications developed in consultation with the Service and will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of nearby caves serving as northern long-eared bat hibernacula. Due to existing construction contracts in place prior to consideration of the northern long-eared bat, this commitment will not be fully implemented prior to the listing of the species. All efforts will be made to blast this in the fall of 2014 and avoid the 2014-15 winter time period

for
Blasting is not anticipated for

Status – Completed for Indiana Bat and Ongoing for the Northern Long-Eared Bat.. All blasting (within all areas) will be done after consulting with the Service, INDOT, and FHWA. Blasting within areas where dimension limestone is quarried will also be completed following special provisions developed in consultation with limestone industry representatives as well as the Indiana Geological Survey (IGS) and other geology experts.

Upon consulting with the Service, the limestone industry representatives concurred that the design plans and INDOT Standard Specifications seem appropriate and that they did not have any further questions or comments regarding the specifications. The Service requested additional coordination if the proposed monitoring reveals that ground movement, vibrations, or other stability measurements are exceeded. As part of the specifications, detailed monitoring requirements are required to ensure blasting techniques do not damage adjacent features. Special provisions were developed with the limestone companies.

c. **Hibernacula Surveys –** A plan for hibernacula surveys (caves and/or mines) will be developed and conducted in consultation with and approved by the Service during Tier 1 studies.

Status – Completed. The plan was completed with the Service and fieldwork has been conducted. To date, 373 cave records were evaluated and 250 caves were visited in the field. Of these, 61 caves met the proper search criteria for habitat and were surveyed for bats in 2004 and 2005. Sixteen caves had fall harp trapping conducted in 2005. These 16 caves also had internal cave surveys completed in December 2005. The northern long-eared bat ranked 1st in number with 1,015 northern long-eared bats harp trapped at cave entrances. Eighteen caves showed northern long-eared bat occupation in the winter based on data from the Service and 2004-05 and 2005-06 winter surveys conducted for the I-69 project.. These caves were

The number of northern long-eared bats found in these hibernacula were very low. Specifically, there were 1,015 northern long-eared bats harp trapped and 15 northern long-eared bats observed in cave surveys. The caves that actually showed northern long-eared bats inside were

d. **Karst Hydrology –** To avoid and minimize the potential for flooding, dewatering, and/or microclimate (i.e., temperature and humidity) changes within hibernacula, site-specific efforts will be made to minimize changes in the amount, frequency, and rate of flow of roadway drainage that enters karst systems that are determined to be hydrologically connected to hibernacula.

Status – Completed for Indiana bat and Ongoing for Northern Long-Eared Bat.
is the only known hibernaculum that is hydrologically connected with the corridor that had Indiana bats at one time, but not for many years.

For the northern long-eared bats, 2 caves have hydrological connections to the Preferred Alternative. They are Clearing of trees has been completed in these areas of Section 4 and 5 respectively. is in close proximity to the roadway and there is potential for impacts. In addition, lies down gradient from the roadway, and has no known hydrological connection to I-69, but there is a potential for impact. These caves will be recognized by FHWA and INDOT as northern long-eared bat hibernacula and receive karst protective measures, as appropriate. Much effort has been taken to protect groundwater resources and caves systems in Section 4. FHWA and INDOT have been working with IDNR, IDEM, and the Service in following the Karst MOU dated October 1993 in Section 4 and will continue such coordination and efforts to protect groundwater resources and cave systems into Section 5. Karst features in the project are solely in Sections 4 and 5.

2. *AUTUMN/SPRING HABITAT*

    a. **Tree Removal –** To minimize adverse effects on bat habitat, tree (three or more inches in diameter) cutting will be avoided within five miles of a known hibernaculum. If unavoidable, cutting will only occur between November 16 and March 31.

Status – To be completed for the northern long-eared bat. Tree cutting within five miles of known hibernacula will only occur between November 15 and March 31.

3. *SUMMER HABITAT*

    a. **Alignment Planning –** Efforts will be made to locate Interstate alignments so they avoid transecting forested areas and fragmenting core forest where reasonable.

Status – To be completed. This effort has been completed for Sections 1 through 5. This effort will continue throughout the final preferred alternative development for Section 6.

    b. **Tree Removal –** Tree and snag removal will be avoided or minimized as follows:

        1. **Tree Cutting –** To avoid any direct take of Indiana bats and northern long-eared bats, no trees with a diameter of 3 or more inches will be removed between April 15 and September 15. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. In the median, outside the clear zone, tree clearing will be kept to a minimum to keep woods in as natural state as reasonable. Forested medians will be managed following the IDNR State Forest Timber Management Plan.

        2. **Avoid and minimize impacts from private landowner harvests within the right of way -** The goal of the measure is to avoid and minimize impacts from private landowner harvests by working with property owners within the right of way who plan to harvest their property. FHWA and INDOT propose to develop an voluntary agreement with the interested landowners, such as a “right of entry”

agreement or other type of covenant, to pay the landowner to limit the time of year in which they harvest their property; this time period would be limited to the late fall and winter when Indiana bats are not present in the forested areas.

Status – To be completed. All tree cutting activities will only occur within the construction limits. All tree clearing within the proposed construction limits will follow the Service's seasonal cutting restrictions. The construction limits will be identified during final design. Based on the Service's revised guidance dated February 14, 2008, the new tree clearing restriction dates of April 1 through September 30 for the SAA will be used for future sections to be developed. The majority of Section 4 and a portion of Section 5 are within the WAA and will follow the dates for autumn/spring habitat removal (as noted above). Clearing of trees in Section 4 and the lower third of Section 5 have been completed.

Note there have been six instances of accidental tree removal that have occurred to date during the time frames mentioned above. These incidences occurred in August and September of 2011, May and June of 2012, and July and November of 2013. In all instances, INDOT/FHWA had qualified biologists review conditions and coordinate with the Service. It was agreed that there was not likely impacts to bats resulting from the accidental tree removals. The Service has been previously notified of all of these instances.

3. **Mist Netting –** In areas with suitable summer habitat for the northern long-eared bat, mist net surveys will be conducted between May 15 and August 15 at locations determined in consultation with the Service as part of Tier 2 studies. If northern long-eared bats are captured in Section 5, some will be fitted with radio transmitters and tracked to their diurnal roosts for at least 5 days unless otherwise determined by the Service.

Status – To Be Completed. One hundred and forty-eight mist netting sites were completed in 2004 and 49 were completed in 2005. This information helped in avoiding sensitive areas that may have impacted this species. However, due to the length of time since the original surveys, the Service has requested that Sections 5 and 6 be mist netted again. As such, mist netting was conducted for Section 5 in the summer of 2012. Mist netting of Section 6 will be scheduled in the future as directed by the Service, FHWA, and INDOT.

c. **Bridges –** Bridges will include the following design features:

1. **Surveys –** The undersides of existing bridges that must be removed for construction of I-69 will be visually surveyed and/or netted to determine their use as night roosts by the northern long-eared bat during the summer.

Status – Completed. Two hundred and fifty-nine (259) bridges and culverts within the SAA were inspected for northern long-eared bats. Of the 259 bridge surveys, northern long-eared bats were found underneath two bridges. They were the

which showed 2 individuals, while the 2 bridge was t

It also showed 2 individuals.

A large bridge that showed many bats and was studied for 6-8 years showed over 8,500 bats of 5 species. The northern long-eared bat was never found under this bridge even though they were a very common species in this geographic area. This bridge will not be removed as a result of the I-69 project. However, due to the presence of bats (especially the Indiana bat) near concentrations of human disturbance (e.g. graffiti), INDOT and FHWA have worked with the Service on fencing both ends of this bridge in order to avoid human disturbance to bats. The fencing is identified as a conservation measure for the Tier 1 BA Addendum. Two fences, approximately 30 feet wide and six feet high with an angled top, were installed under the bridge in April 2006 by INDOT Vincennes District. In September 2007, signs were installed at the bridge indicating that coordination with INDOT Vincennes District and the Service will be required for work performed on or within 200 feet of the bridge. Both fences have a gate and a key for the Service to access. As of January 2009, the terms and conditions for this commitment were considered met and INDOT is not proposing any other monitoring of the bridge as part of I-69.

2. **Bat-friendly bridges –** Where feasible and appropriate, interstate and frontage road bridges will be designed to provide suitable night roosts for bats in consultation with the Service.

Status – Due to concerns about attracting bats to the high-speed interstate facility, it is not currently proposed to include any "bat friendly" bridges along I-69. The Service concurs with no "bat friendly" bridges.

3. **Floodplains –** Where reasonable and appropriate, floodplains and oxbows will be bridged to protect environmentally sensitive areas. The Patoka River floodplain will be bridged in its entirety, thus minimizing impacts to many different habitats.

Status – To be completed. The majority of the Pigeon Creek (Section 1), Patoka River (Section 2), Flat Creek (Section 2), Prairie Creek (Section 3), First Creek (Section 3), Doan's Creek (Sections 3 and 4), Black Ankle Creek (Section 4), Dry Branch (Section 4), Plummer Creek (Section 4), Indian Creek (Section 4), and an unnamed tributary (UNT) to Clear Creek (aka May Creek) (Section 4) floodplains have been or will be bridged. Although no floodplains within Section 4 will be bridged in their entirety, floodplain encroachments have been minimized where reasonable through design practices such as longer bridges and perpendicular stream crossings. Although it is not anticipated that any floodplains within Section 5 will be bridged in their entirety, floodplain encroachments will be minimized where reasonable by utilizing existing bridge crossings and design practices such as longer bridges and perpendicular stream crossings where new crossings are warranted. Bridging allows for wildlife corridors and the greatest clearance is beneficial for bats to fly under these bridges.

d. **Stream Relocations –** Site-specific plans for stream relocations will be developed in design considering the needs of sensitive species and environmental concerns. Plans will include the planting of woody and herbaceous vegetation to stabilize banks. Such plantings will provide foraging cover for many species. Stream Mitigation and Monitoring plans will be developed for stream relocations, as appropriate.

Status – To be completed. This will be completed during mitigation and permitting. The final design plans continue to be reviewed to assure conformance with the previously secured permits. Specific mitigation sites have been purchased in some sections. Note some of the mitigation regarding stream relocations occurring within maternity colonies is being conducted onsite using natural channel design.

4. *ALL HABITATS*

   a. **Medians and Alignments –** Variable-width medians and independent alignments will be used where appropriate to minimize impacts to sensitive and/or significant habitats. Context sensitive solutions will be used, where possible. This may involve vertical and horizontal shifts in the Interstate.

Status – To be completed. This will occur where appropriate and possible in final design and construction in each section. These were not used for Sections 1 and 3. For Section 2, variable width medians were used in one area outside a maternity colony area. For Section 4, it was determined it was not appropriate to use variable-width medians given design constraints. A typical median width of 60 feet is proposed and no trees will be left in the median. For Sections 5 and 6, a typical median width of 60 feet is proposed. No trees will be left in the median for the majority of Section 5 with the exception of a small stretch (approximately 1.4 miles) of split roadway north of Burma Road and Bryant Creek Road in the Morgan-Monroe State Forest area. This split minimizes impacts to forest habitat, the State Forest, and streams.

Environmentally sensitive areas in Section 2 include the Patoka River National Wildlife Refuge, Flat Creek, Prides Creek, and the East Fork of the White River. Environmentally sensitive areas in Section 4 include Black Ankle Creek/Koleen Bottoms and all Indian Creek crossings. Environmentally sensitive habitats in Section 5 include recharge areas.

   b. **Minimize Interchanges –** Efforts have been made to limit interchanges in karst areas, thereby limiting access and discouraging secondary growth and impacts. In Tier 2, further consideration will be given to limiting the location and number of interchanges in karst areas.

Status – Completed. Only Sections 4 and 5 are located within the Karst Region. Interchanges in Section 4 include SR 45, Greene/Monroe County Line, and SR 37. Interchanges in Section 5 include Fullerton Pike, combined Tapp Road and SR 45/2nd Street, SR 48/3rd Street, SR 46, Walnut Street, Sample Road, and Liberty Church Road. Existing interchanges in Section 5 include SR45/2nd Street, SR 48/3rd Street, SR 46, and Walnut Street. These interchanges have been designed to limit impacts in karst areas. Specific design elements include folded ramps, the use of smaller urban-style interchanges in rural areas, and using existing interchange locations, overpasses and pavement layouts when possible. Liberty Church Road is not in karst terrain.

   c. **Memoranda of Understandings (MOUs) –** Construction will adhere to the Wetland MOU (dated January 28, 1991) and Karst MOU (dated October 13, 1993). The Wetland MOU minimizes impacts to the northern long-eared bat by mitigating for wetland losses, and creating bat foraging areas at multiple ratios to those lost to the project. The Karst MOU avoids and minimizes impacts to the northern long-eared bat by numerous measures which protect sensitive karst features including hibernacula.

Status – To be completed. This will be coordinated prior to or during construction. Procedures established in these MOUs will be adhered to during the planning phase and will be incorporated into the Mitigation and Monitoring Plan for each mitigation site. Coordination with the Karst MOU signatory agencies for Section 4 began in fall 2011 and is ongoing. Coordination with the Karst MOU signatory agencies for Section 5 is anticipated to start prior to construction.

d. **Water Quality –** Water contamination will be avoided/minimized by the following:

1. **Equipment Service –** Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.

Status – To be completed. Procedural steps 1-4 of the Karst MOU are being addressed in Tier 2. In addition, this item will be incorporated as a special provision in all contracts, as applicable.

2. **Roadside Drainage** - Where appropriate in karst areas, roadside ditches will be constructed that are grass-lined and connected to filter strips and containment basins. The development of these measures will be coordinated with the Karst MOU agencies.

Status – To be completed. In Section 4, roadside ditches may include geo-membrane lining, rock filters or detention basins. No roadside drainage will be directly discharged into a karst feature (dry well). Coordination with the Karst MOU signatory agencies for Section 4 began in fall 2011 and is ongoing. Specific impacts to karst features and treatment of drainage has not yet been determined for Section 5. Impacts to specific karst features in Section 5 will be addressed via consideration of alternative drainage and other appropriate mitigation features during final design. Such treatment measures include peat and sand filters, gravel filters, vegetated buffers, and lined spill or run-off containment structures.

3. **Equipment Maintenance** - Construction equipment will be maintained in proper mechanical condition.

Status – To be completed. This item is contained in the INDOT Standard Specifications and will be implemented during construction.

4. **Spill Prevention/Containment –** The design for the roadway will include appropriate measures for spill prevention/containment.

Status – To be completed. Special measures, including diversions of highway runoff from direct discharge off of bridge decks into streams and containment basins to detain accidental spills, will be incorporated into final design plans for perennial streams within the northern long-eared bat maternity colony areas to address water quality concerns. Within Section 1, this includes Pigeon Creek and its tributaries. Within Section 2, this includes Hurricane Creek, Patoka River, Flat Creek, Mud Creek, East Fork of the White River, Jackson Pond tributary, Veale Creek, and Hurricane Branch of Veale Creek. Within Section 3, this includes Weaver and

Vertrees Ditches. Within Section 4, this includes Black Ankle Creek, Dry Branch, and the three most northern Indian Creek crossings. The remaining perennial streams, Plummer Creek, Mitchell Branch, the southernmost Indian Creek, an UNT to Clear Creek (aka Happy Creek), and an UNT to Clear Creek (aka May Creek) all fall within the WAA. Locations within Section 5 are still to be defined. Measures for spill prevention/containment will be included in the roadway design.

Contractors will be required to provide an acceptable spill response plan which will include telephone numbers for emergency response personnel and copies of agreements with any agencies which are part of the spill response effort. An emergency response telephone number is also required. The Rule 5 Permit will require each contractor have spill containment plans in their contract documents.

5. **Herbicide Use Plan –** The use of herbicides will be minimized in environmentally sensitive areas such as karst areas to protect northern long-eared bats and their prey. Environmentally sensitive areas will be determined in coordination with the INDOT, and as appropriate, the INDOT consultants. Appropriate signage will be posted along the interstate to alert maintenance staff of these areas.

Status – To be completed. The use of herbicides will be minimized within environmentally sensitive habitats. In addition, the herbicide use plan will include any drainage area of a karst feature which is used for highway drainage. Appropriate signage will be posted along the interstate to alert maintenance staff of these environmentally sensitive areas. Within Section 2, this includes the Patoka River National Wildlife Refuge, Flat Creek, Prides Creek and the East Fork of the White River. Within Section 4, this includes Black Ankle Creek/Koleen Bottoms and all Indian Creek crossings. Within Section 5, this includes recharge areas.

6. **Re-vegetation –** Re-vegetation of disturbed areas will occur in accordance with the INDOT standard specifications. Woody vegetation will only be utilized beyond the clear zone. Re-vegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers, as appropriate, similar to the native seed mixes of other nearby states.

Status – To be completed. Re-vegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be used a reasonable distance beyond the clear zone to ensure a safe facility. Re-vegetation of disturbed soils within the right-of-way and medians will utilize native grasses and wildflowers as appropriate, such as those cultivated through INDOT's Roadside Heritage program. Within Section 2, locations include the SR 61/56 Intersection, North Pike, South Daviess, and US 50. Within Section 4, locations may include Black Ankle Creek, an UNT to Clear Creek (aka May Creek), and Indian Creek crossings. Other areas may include interchange locations. Locations within Section 5 are still to be defined.

7. **Low Salt Zones –** A low salt and no spray strategy will be developed in karst areas for this project. A signing strategy for these items will

also be developed. The low salt zones will be determined in coordination with the INDOT.

Status – To be completed. For Section 4, the BA states that low salt zones will be defined within any drainage area of a karst feature which is used for highway drainage within the karst region (Taylor Ridge Road north to SR 37—approximately 22.3 miles). For Section 5, the limits for the low salt/no spray zone in Section 5 will be along I-69 continuing from Section 4 to 200 feet north of the existing SR 37/Chambers Pike Intersection. Signs illustrating *Low Salt/No Spray Zone* and *Report All Spills to 1-888-233-7745* were developed and approved by INDOT in 2011. For Section 4, *Low Salt/No Spray Zone* signs will be placed along both sides of the road (each travel direction) within the karst portion of the roadway, approximately three miles apart and at entrance ramps leading to the highway for a total of 24 signs.

Signs showing *Report All Spills to 1-888-233-7745* will be placed following the above recommendations but will be inserted in between the *Low Salt/No Spray Zone* signs for a total of 16 signs. Similar signs and spacing will be used within the karst areas of Section 5.

8. B**ridge Design** – Where feasible and appropriate, bridges will be designed with none or a minimum number of in-span drains. To the extent possible, the water flow will be directed towards the ends of the bridge and to the riprap drainage turnouts.

Status – To be completed. This will be coordinated in the final design of bridges crossing perennial streams located within the maternity colony areas. For a list of these perennial streams, see "Spill Prevention/Containment" (#4 above).

e. **Erosion Control** – Temporary erosion control measures will be used to minimize sediment and debris. Timely re-vegetation after soil disturbance will be implemented and monitored. Re-vegetation will consider site specific needs for water and karst. Erosion control measures will be put in place as a first step in construction and maintained throughout construction.

Status – To be completed. Best Management Practices (BMPs) will be used during construction to minimize impacts of erosion. Erosion control measures will be put in place as a first step in construction and maintained throughout construction. Temporary erosion control devices, such as silt fencing, check dams, sediment basins, inlet protection, sodding, and other appropriate BMPs will be used to minimize sediment and debris in tributaries and karst features within the project area.

Timely re-vegetation will be implemented after soil disturbance and monitored. Any riprap used will be a large diameter to allow space for habitat for aquatic species after placement. Slopes will be designed that resist erosion. If slopes exceed 2:1, they will include stabilization techniques. Soil bioengineering techniques for bank stabilization will be considered where situations allow.

In addition to the above measures, a video has also been prepared to help assure compliance with erosion control measures. This video will be viewed by personnel (i.e. engineering supervisors, equipment operators, construction personnel, INDOT maintenance) prior to construction activities in all Sections. Additional specifications have also been added to Section 4 contracts for erosion control.

f. **Parking and Turning Areas –** Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing, and will avoid environmentally sensitive areas, such as karst.

Status – To be completed. This will be identified in construction contracts.

B. Restoration / Replacement

1. SUMMER HABITAT

a. **Summer Habitat Creation/Enhancement –** Northern long-eared bat summer habitat will be created and enhanced in the Action Area through wetland and forest mitigation focused on riparian corridors and existing forest blocks to provide habitat connectivity. The following areas and possibly others have been investigated for wetland and forest mitigation to create and enhance summer habitat for the Indiana bat: Pigeon Creek, Patoka River bottoms, East Fork of the White River, Thousand Acre Woods, White River (Elnora), First Creek, American Bottoms, Garrison Chapel Valley, Beanblossom Bottoms, White River (Gosport), White River (Blue Bluff), and Bradford Woods. In selecting sites for Indiana bat summer habitat creation and enhancement, priority was given to sites located within a 2.5 mile radius from a recorded capture site or roost tree. If willing sellers cannot be found within these areas, other areas may be used as second choice areas as long as they are within the Action Area and close enough to benefit these maternity colonies, or are outside the Action Area and still deemed acceptable to the Service. Where appropriate, mitigation sites will be planted with a mixture of native trees largely comprised of species that have been identified as having relatively high value as potential northern long-eared bat roost trees. Tree plantings will be monitored for 5 to 10 years after planting to ensure establishment and protected in perpetuity via conservation easements.

Status – To be completed. This will occur during mitigation and permitting. Tree plantings are anticipated to be monitored for 10 years. Additional conceptual detail has been and will be provided in the Tier 2 BA for each section. In addition to the areas mentioned above, Veale Creek, Flat Creek, Indian Creek, Plummer Creek, Doan's Creek, areas adjacent to the White River, Little Clyfty Branch, Crooked Creek, Lambs Creek, Morgan-Monroe State Forest, Beanblossom Nature Preserve, and Maple Grove Road Rural Historic District were investigated for wetland and forest mitigation possibilities in order to enhance summer habitat for the northern long-eared bat. Specific mitigation sites have already been purchased in some sections. Coordination with interested landowners is ongoing. Mitigation sites for the Indiana bat are considered mitigation sites for the northern long-eared bat.

b. **Wetland MOU –** Wetlands will be mitigated at ratios agreed upon in the Wetland MOU (dated January 28, 1991). Wetland replacement ratios are as follows:

1. Farmed 1 to 1.

2. Scrub/shrub and palustrine/lacustrine emergent 2 – 3 to 1 depending upon quality.

3. Bottomland hardwood forest 3 – 4 to 1 depending upon quality.

4. Exceptional, unique, critical (i.e. cypress swamps) 4 and above to 1 depending upon quality.

Status – To be completed. This will occur during mitigation and permitting. Additional conceptual detail will be provided in the Tier 2 BA for each section. Specific mitigation sites have already been purchased in some sections.

c. **Forest Mitigation –** The Tier 1 Forest and Wetland Mitigation and Enhancement Plan identifies the general location of potential mitigation sites for upland and bottomland forests. Preference will be given to areas contiguous to large forested tracts that have recorded federal and state listed species. The actual mitigation sites implemented will be determined in Tier 2 in consultation with the Service and other environmental review agencies. Coordination with the environmental review agencies will assure that these forest mitigation sites are strategically situated in biologically attractive ecosystems. Forest impacts will be mitigated at a ratio of 3 to 1. All forest mitigation lands will be protected in perpetuity via conservation easements. The 3:1 forest mitigation may not be located entirely within the Action Area. Forest impacts occurring within each of the northern long-eared maternity colony areas would be mitigated by replacement (i.e. planting of new forest and purchase of existing) at approximately 3:1, preferably in the vicinity of the known roosting habitat.

Status – To be completed. This will occur during mitigation and permitting. Additional conceptual detail will be provided in the Tier 2 BA for each section. Coordination with the Service has indicated that of this 3:1 ratio, 2:1 may be preservation, while restoration is at a minimum of no net loss or 1:1. In addition to conservation easements, deed restrictions may also be used to protect mitigated lands. Specific mitigation sites have already been purchased in some sections for the Indiana bat and are anticipated also to be accepted as mitigation sites for the northern long-eared bat.

C. <u>Conservation / Preservation</u>

1. <u>*Winter Habitat*</u>

a. **Hibernacula Purchase –** Opportunities will be investigated to purchase at fair market value from “willing sellers,” Indiana bat and northern long-eared bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and implementation of all management efforts, hibernaculum(a) and all buffered areas will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

Status – Completed. Property owners of Indiana bat hibernacula within and outside the WAA were contacted to determine if they are interested in being willing sellers. Conservation easements have been purchased for

The owners of

are not willing sellers. There are three caves that are currently managed by federal/state/local agencies and/or environmental organizations; these include The property owners of were also contacted, but were either not interested in selling/giving easements or did not respond. These caves also are hibernacula for the northern long-eared bat, so the purchase of benefit the northern long-eared species.

In addition, FHWA and INDOT have improved the opening of for greater air flow and cooler temperatures. It is a suspected northern long-eared bat hibernaculum based on August 2004 harp trap data obtained for the I-69 project. In the purchase of these caves, FHWA and INDOT have also purchased 100's of acres of high quality foraging areas for both the Indiana bat and the northern long-eared bat and protected hundreds of karst-related features from potential development.

b. **Hibernacula Protection –** With landowner permission, investigations will coordinate with the Service on acquiring easements to erect bat-friendly angle-iron gates at cave entrances. These gates prevent unauthorized human access and disturbance of hibernacula, while maintaining free airflow within the hibernacula within the Action Area. Gates will be constructed according to designs from the American Cave Conservation Association. Effects of gates on water flow and flash flooding debris will be carefully evaluated before and after gates are installed. Other structures (e.g., perimeter fencing) or techniques (e.g., alarm systems and signs) may be used.

Status – To be completed. Fencing has been installed at the entrance to In 2012, the large rocks were removed from the entrance of to allow for greater airflow and lower temperatures which could create conditions more conducive for northern long-eared bats and Indiana bats. The Service has already installed data loggers for background temperature measurements. Studies from 1982 to present have not observed Indiana bats in but it is considered a hibernaculum for the northern long-eared bat. is currently being evaluated to determine the need for a gate.

2. *AUTUMN/SPRING HABITAT*

a. **Autumn/Spring Habitat Purchase –** Any hibernaculum(a) purchased as part of conservation for Indiana bat or northern long-eared bat winter habitat will include associated autumn swarming/spring staging habitat to the maximum extent practicable. Any purchase will be from a willing seller at fair market value. In addition, some parcels containing important autumn swarming/spring staging habitat may be acquired near key hibernacula regardless of whether the hibernacula themselves are acquired. Any acquired autumn swarming/spring staging habitat would be conveyed to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. The purchase of forestland would be included as part of the 3:1 mitigation.

Status – Completed. Conservation easements have been purchased for

3. *SUMMER HABITAT*

   a. **Summer Habitat –** Investigations will be coordinated with the Service on purchasing lands at fair market value in the Action Area from "willing sellers" to preserve summer habitat. Any acquired summer habitat area will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

Status – To be completed. This will occur during mitigation and permitting. Additional conceptual detail will be provided in the Tier 2 BA for each section. Specific mitigation sites (containing summer habitat) have already been purchased in some sections.

D. Education / Research

1. *Winter Habitat*

   a. **Monitor Gated Caves –** All caves that have gates erected as mitigation for this project will have their temperature, humidity, bat activity and populations monitored before and for three years after gate installation. Infra-red video monitoring or other techniques deemed acceptable by the Service will be conducted for a minimum of two nights in the appropriate season at each newly installed cave gate to ensure the bats are able to freely ingress and egress. Data acquisition will use a number of data loggers minimizing the need for entry into these caves. All precautionary measures will be taken to minimize potential impacts to hibernating Indiana bats and northern long-eared bats.

Status – To be completed. is currently being evaluated to determine the need for a gate. Coordination with the new property owner regarding use limitations and the ongoing monitoring has been completed; follow-up coordination for a review of the cave is planned in 2014. Currently, no other cave gates are anticipated as part of I-69 mitigation. However, review of will be conducted with Bat Conservation International (BCI) and the Service for input during review of which is a known hibernacula for the northern long-eared bat.

b. **Cave Warning Signs –** Where deemed appropriate by the Service, the following may be done: signs will be posted that warn the public and discourage cave entry at hibernacula within/near the Action Area. Signs should be placed so that they do not block airflow into the cave and do not draw attention to the entrance and attract violators (USFWS, 1999). Also, light-sensitive data loggers may be placed within the caves to assess the effectiveness of the warning signs at deterring unauthorized entries. Permission from the landowners must be obtained before erecting such signs and installing data loggers.

Status – To be completed. This can be completed any time prior to or during construction of the roadway. In cooperation with the property owner (who is not a willing seller), the entrance to is currently being monitored for unauthorized access. A camera and warning signs are installed at the entrance to , fencing with warning signs are installed at the entrance to and warning signs are installed at As a result of conversations between INDOT and the Service, a warning sign was placed at the entrance to in 2012 by the Service. A warning sign was also placed at the entrance to in 2012.

c. **Biennial Census –** Total funding of $50,000 will be provided to supplement the biennial winter census of hibernacula within/near the proposed Action Areas. Funding will be made available in consultation with the Service.

Status – To be completed. A MOU was prepared between INDOT and the Service for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by the Service.

2. <u>AUTUMN/SPRING HABITAT</u>

a. **Autumn/Spring Habitat Research –** Total funding of $125,000 will be provided for research on the relationship between quality autumn/spring habitat near hibernacula and hibernacula use within/near the Action Area. This research should include methods attempting to track bats at longer distances such as aerial telemetry or a sufficient ground workforce. A research work plan will be developed in consultation with the Service. Funding will be made available as soon as practical after Notice to Proceed is given to the construction contractor for the applicable Tier 2 Section (or earlier).

Status – To be completed. A MOU was prepared between INDOT and the Service for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by the Service

3. <u>SUMMER HABITAT</u>

a. **Mist Netting –** A work plan for surveying, monitoring, and reporting will be developed and conducted in consultation with and approved by the Service. This mist netting research will be in addition to Tier 2 sampling requirements. Fifty-two mist netting sampling sites are presently under consideration. In earlier discussions, FHWA/INDOT agreed with the Service to complete surveys at 50 mist netting sites; however, 2 additional sites have been added to the list as recommended by the Service. To limit the number of surveyed sites to 50, possibly 2 sites can be removed in Section 6. Monitoring surveys focused at known maternity colonies will be completed the summer before construction begins in a given section and will continue each subsequent summer during the construction phase and for at least five summers after construction has been completed. If Indiana bats are captured in any section, or northern long-eared bats are captured in Section 5 (as well as in Section 6 when construction occurs there), radio transmitters will be used in an attempt to locate roost trees, and multiple emergence counts will be made at each located roost tree. These monitoring efforts will be documented and summarized within an annual report prepared for the Service.

Status – To be completed. Surveys will be conducted pre-construction, during construction and for five years post-construction. Pre-construction surveys will be conducted within the summer bat mist netting season immediately prior to the start of construction activities (including tree clearing) for any given construction contract. Surveys during construction will be conducted each year up to the year that the highway is open to traffic. The first of the five post-construction surveys will begin the summer following completion of the Section when the highway is open to traffic. Sites for this additional sampling include the following:

Section and Sites	**# of Sites**
Section 1 – Sites 3, 3B, 4C and 5	4
Section 2 – Sites 6, 7, 8, 11, 12, 12B, 14, 22, 29, and 30	10
Section 3 – Sites 11, 13, 14, 15, 18, 19, 21, and 23	8
Section 4 – Sites 2, 3, 8, 11, 14A, 18, 21, 23, 24, 27A, and 28	11
Section 5 – Sites 2, 4, 6, 14A, 17, 19, 22 and 24	8
Section 6 – Sites 5, 7, 8, 10, 13, 14, 17, 19, 20, 22 and 23	11
Total	52

Sections 1 through 5 pre and post-construction mist netting sites have been approved by the Service. Pre-construction mist netting was completed in 2008 for Section 1, while construction year mist netting was completed in 2009 through 2012 for four sites in Section 1. In 2012, Site 4 was replaced with Site 4C. Pre-construction mist netting was completed in 2010 for Sections 2 and 3, while construction year mist netting was completed in 2011 and 2012. The 2013 survey for Sections 1, 2, and 3 represents the first year of post-construction monitoring since the highway was open to traffic in 2012. In 2013, Site 22 for Section 3 was replaced with Site 23 due to lack of property owner access permission. Pre-construction mist netting for Section 4 (Sites 2, 3, 8, 11 and 14) was completed in 2010. Due to the location of construction segments scheduled for the fall-winter-spring of 2011 and 2012, the pre-construction survey for Site 18 was conducted in 2011. Similarly, pre-construction for Sites 21, 23, 24, 27A and 28 was completed in 2012. In 2012, Site 14 was replaced with Site 14A due to lack of property owner access permission. The 2013 survey for Section 4 (11 sites) represents a construction year monitoring effort. Mist netting was completed for 24 sites in Section 5 in 2012. The 2012 survey is anticipated to serve as the pre-construction survey in Section 5.

Note that three additional maternity colonies have been found since the original 13 colonies were identified in 2004 and 2005. They are associated with Clyfty Creek (Section 4), Beanblossom Nature Preserve (Section 5), and Lambs Creek (Section 5). No additional maternity colonies were found in 2013. The Beanblossom Nature Preserve colony was discovered by the Service and requested by them to be added to the I-69 colonies.

For the northern long-eared bat, the Service has identified 38 maternity colonies associated with I-69. These are broken down as follows:

Section 1	
	Pigeon Creek South
	Pigeon Creek North
Section 2	
	Patoka South Fork
	Robinson South
	Robinson North
	Flat Creek
	East Fork White River
	Aikman Creek
Section 3	
	Thousand Acre Woods
	North Fork Prairie Creek
	Smothers Creek
	White River – Weaver Ditch
	White River – Fourmile Creek
	First Creek West
	First Creek East
	Doans Creek West
Section 4	
	Bogard Creek
	Doans Creek East
	Black Ankle Creek
	Plummer Creek
	Mitchell Branch
	Little Indian Creek Monroe
	Indian Creek South
	Indian Creek West
	Indian Creek North
Section 5	
	Beanblossom East
	Beanblossom West
	Indian Creek Morgan
	Bryant Creek South
	Little Indian Monroe
	Bryant Creek North
	Jordan Creek
	Little Indian Creek Morgan

	Lambs Creek
Sections 6	Clear Creek East Fork White River White River – Goose Creek Pleasant Run

4. *GENERAL*

a. **Educational Materials –** Total funding of $25,000 will be provided for the creation of an educational poster or exhibit and/or other educational outreach media to inform the public about the presence and protection of bats, particularly the Indiana bat and northern long-eared bat. Funding would be provided after a Notice to Proceed is issued for construction of the first section of the project.

Status – To be completed. The name of this conservation measure was changed to “Educational Poster” per request from the Service in 2009. The Service indicated they would like to finalize the posters. A MOU was prepared between INDOT and the Service for the transfer of funds to address this commitment. Per the MOU, these funds will be made available upon submittal of a project plan by the Service.

b. **Rest Areas –** Rest areas will be designed with displays to educate the public on the presence and protection of sensitive species and habitats. Attractive displays near picnic areas and buildings will serve to raise public awareness as they utilize I-69. Information on the life history of the Indiana bat, protecting karst, and protecting water quality will be included in such displays.

Status – No rest areas are being proposed.

c. **Access to Patoka NWR –** If reasonable, an interchange will be constructed that would provide access to a potential Visitor’s Center at the Patoka River National Wildlife Refuge.

Status – Completed. Interchanges within the vicinity of the Patoka River National Wildlife Refuge include signage directing motorists to the Refuge’s office. The nearest interchange to the Patoka River National Wildlife Refuge is at SR 64, west of Oakland City. Another interchange is south of Petersburg, at SR 57. The SR 64 interchange has this directional signage.

d. **GIS Information –** GIS maps and databases developed and compiled for use in proposed I-69 planning will be made available to the public. This data provides information that can be used to determine suitable habitats, as well as highlight other environmental concerns in local, county, and regional planning. Digital data and on-line maps were made available from a server accessed on the IGS website at IU: http://igs.indiana.edu/arcims/statewide/index.html. In addition, detailed GIS forest data (five meter resolution) has been developed for the 13 maternity colony foraging areas (circles with 2.5 mile radius) and WAA; and as part of this Tier 1 BA Addendum for the northern long-eared bat, 38 maternity colonies (1.5 mile radii) are analyzed for indirect and cumulative in Sections 1-

4, and those in Section 5 and 6 will have direct, indirect and cumulative impact analysis. This data was developed in order to better determine habitat impacts to the Indiana bat and the northern long-eared bat. This is the most accurate and detailed forest data known to exist for those areas. This data could potentially be used by the Service, other government agencies, or students to examine effects on the Indiana bat, northern long-eared bat, other species, or ecosystems over time.

Status – Completed. The website is: http://www.indianamap.org/

Appendix B