APPENDIX BB

REVISED TIER 1 BO and AMENDMENT TO REVISED TIER 1 BO

Part A: Revised Tier 1 BO (Redacted)
Part B: Amendment to Revised Tier 1 BO (Redacted)

Part A: Revised Tier 1 BO (Redacted)

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

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:

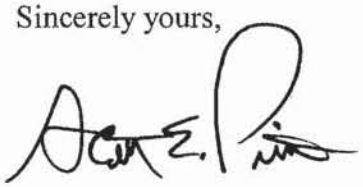
The enclosed document transmits the U.S. Fish and Wildlife Service's (Service) Revised Programmatic Biological Opinion (BO) regarding the proposed construction, operation, and maintenance of Alternative 3C of Interstate 69 (I-69) from Indianapolis to Evansville, Indiana and its effects on the Federally 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
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enclosure

REVISED PROGRAMMATIC BIOLOGICAL OPINION

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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Bloomington Field Office
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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.

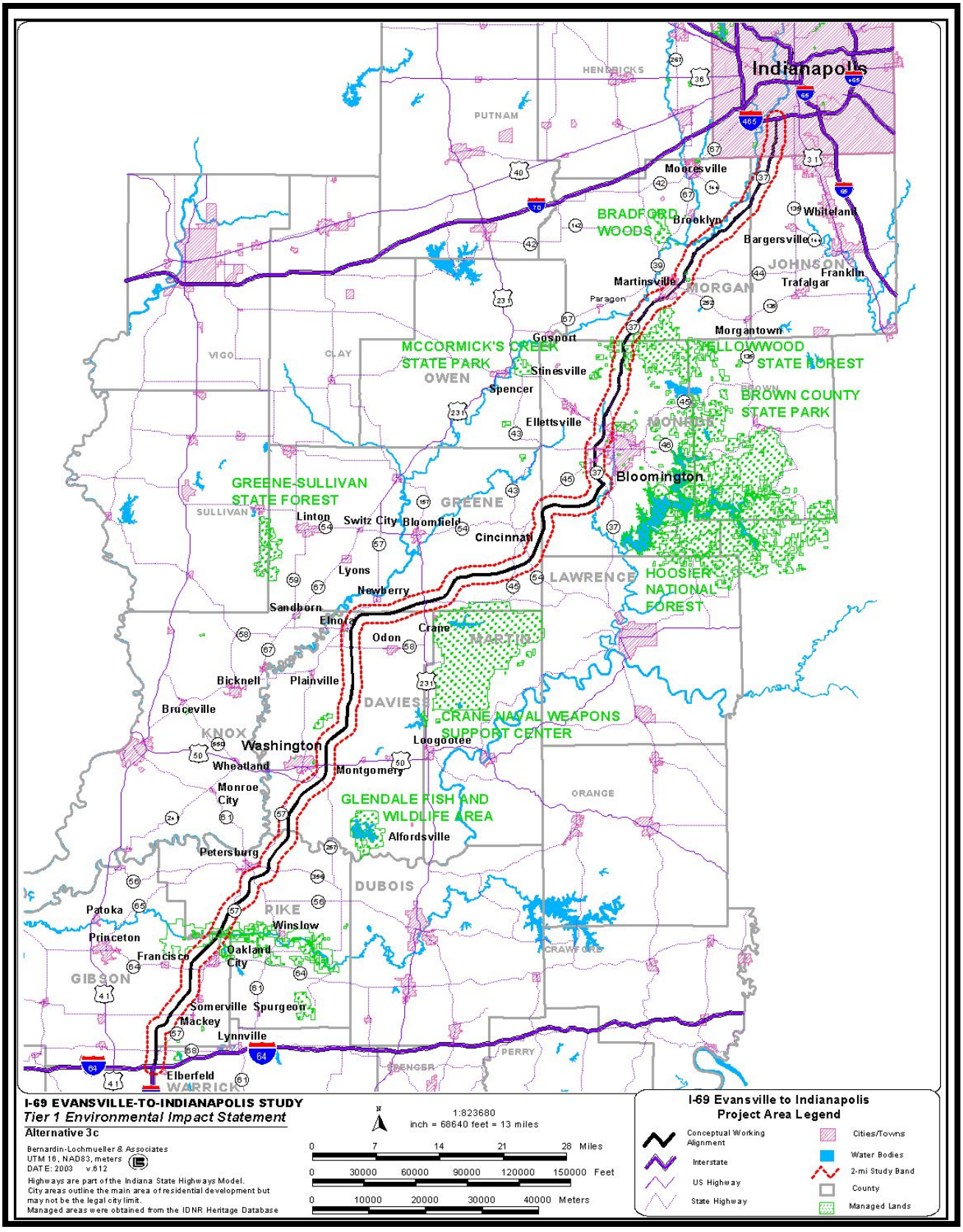


Figure 1. Proposed corridor for I-69 from Evansville to Indianaplis (Alternative 3C).

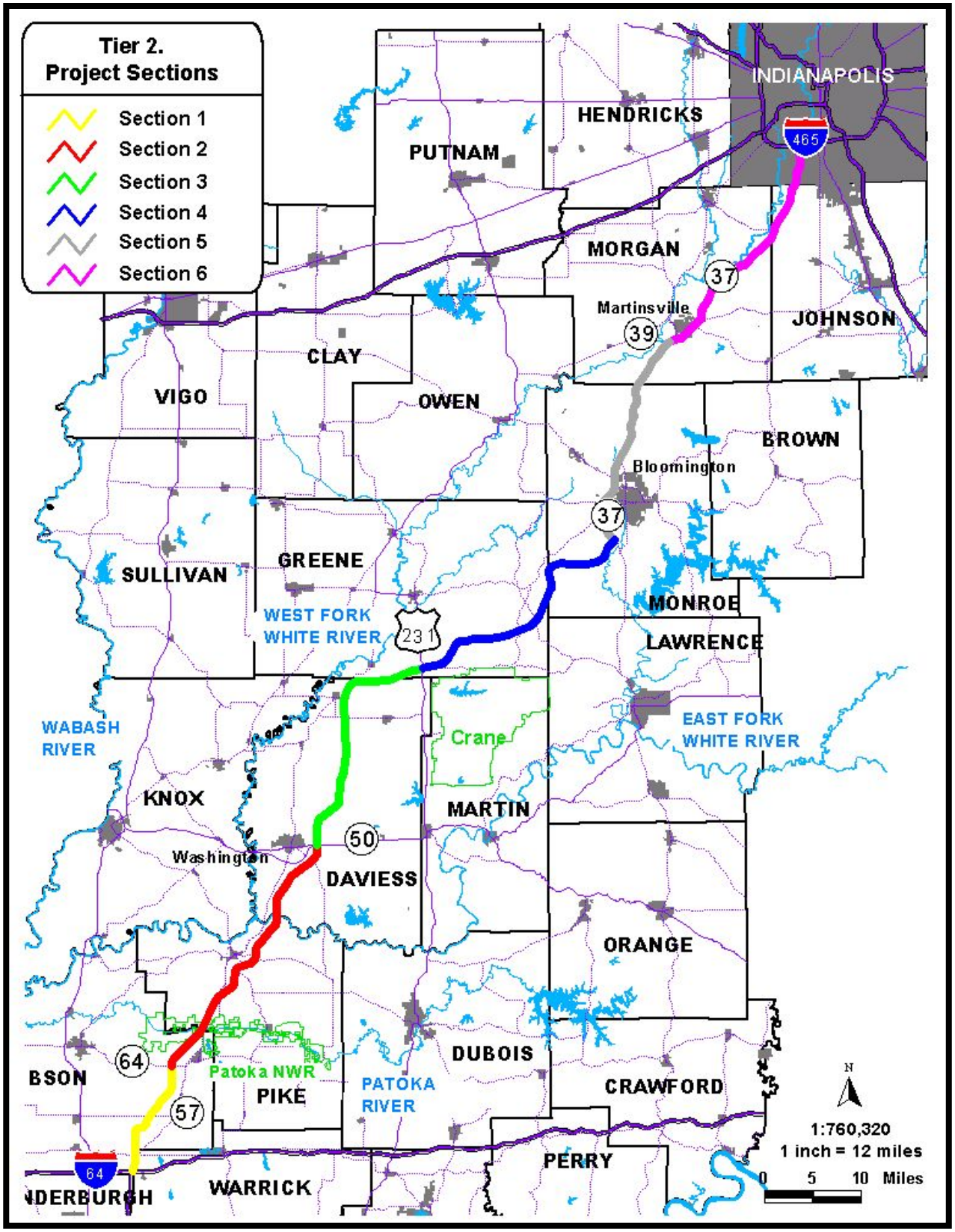


Figure 2. Tier 2 project sections.

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.

Status Report – 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.

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.
   Status Report - To be completed.

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.
   Status Report – 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.
      Status Report – 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.
      Status Report – 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.
      Status Report – 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.

Status Report – 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.

   Status Report – 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.

   Status Report – 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).

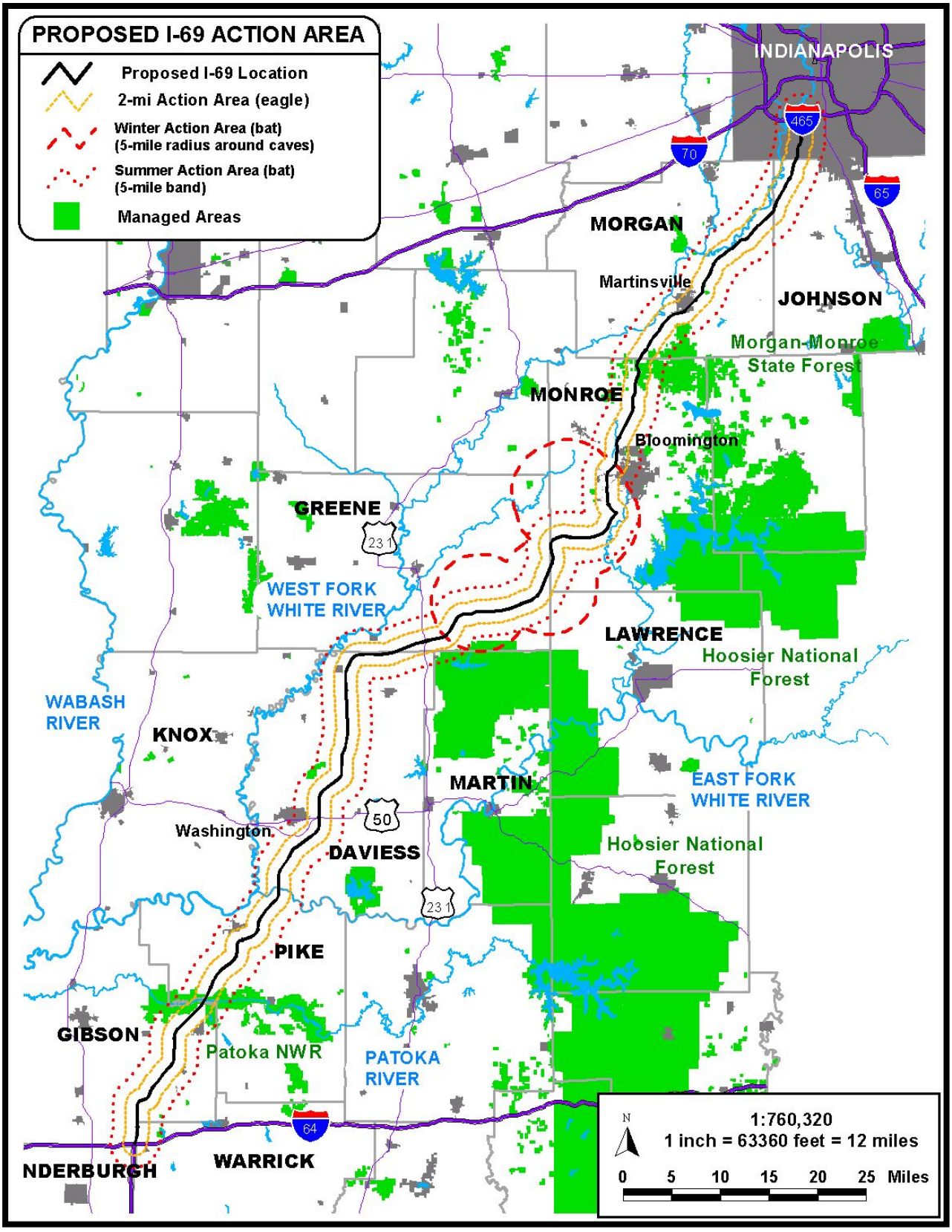


Figure 3. Original I-69 Action Areas for the Indiana bat and bald eagle.

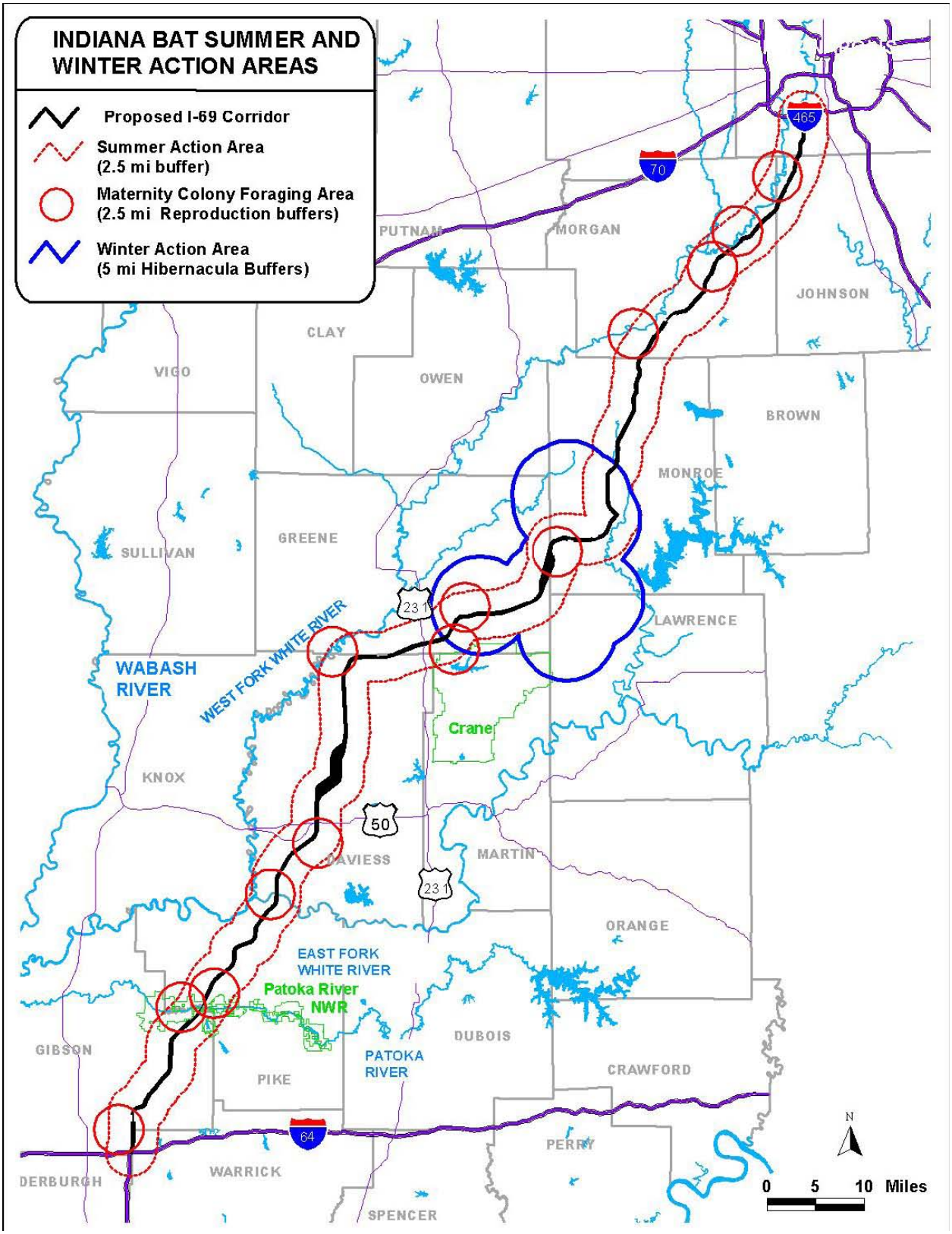


Figure 4. Revised I-69 Indiana Bat Summer and Winter Action Areas (Excluding and Cave).

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.

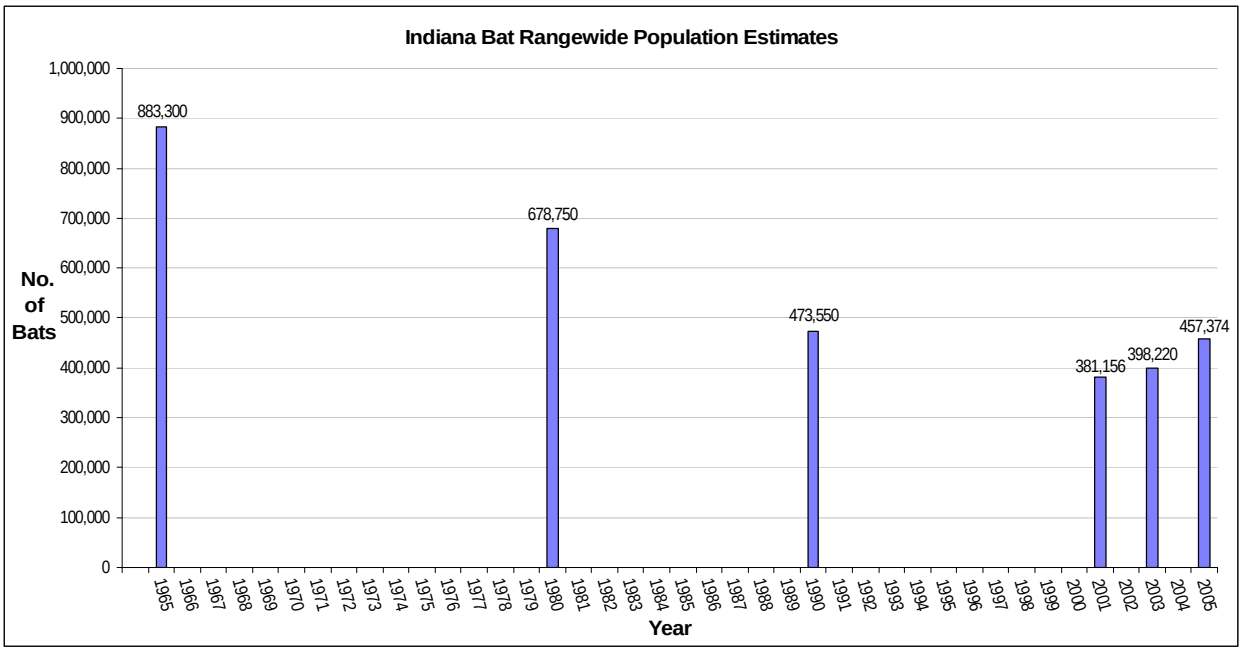


Figure 5. Indiana bat rangewide population estimates (Data sources: 1965-1990, Clawson 2002; 2001-2005, USFWS, unpublished data, 2006). Rangewide estimates calculated from all known hibernacula were not attempted or data was not available for most years prior to 2001.

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

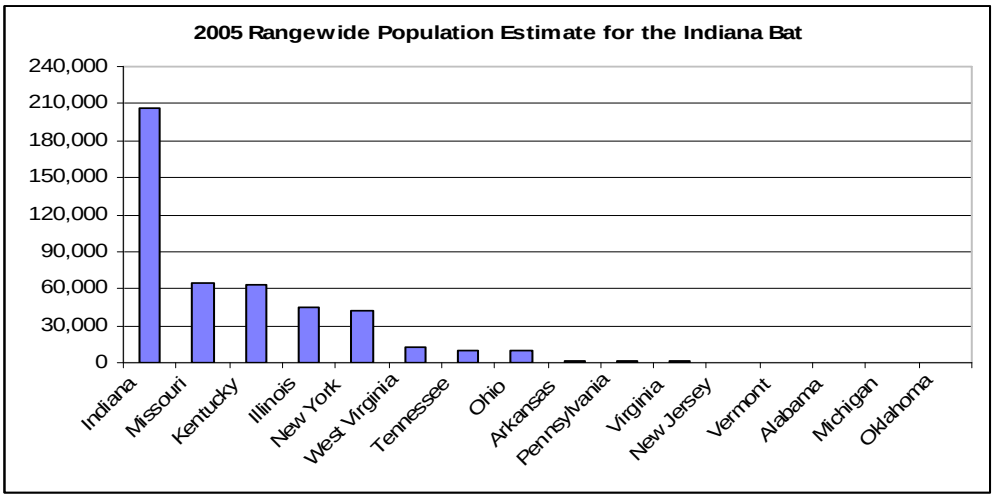


Figure 6. State-by-state results of the 2005 Indiana bat winter hibernacula surveys.

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).

Previous Incidental Take Authorizations

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).

Bald Eagle

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.

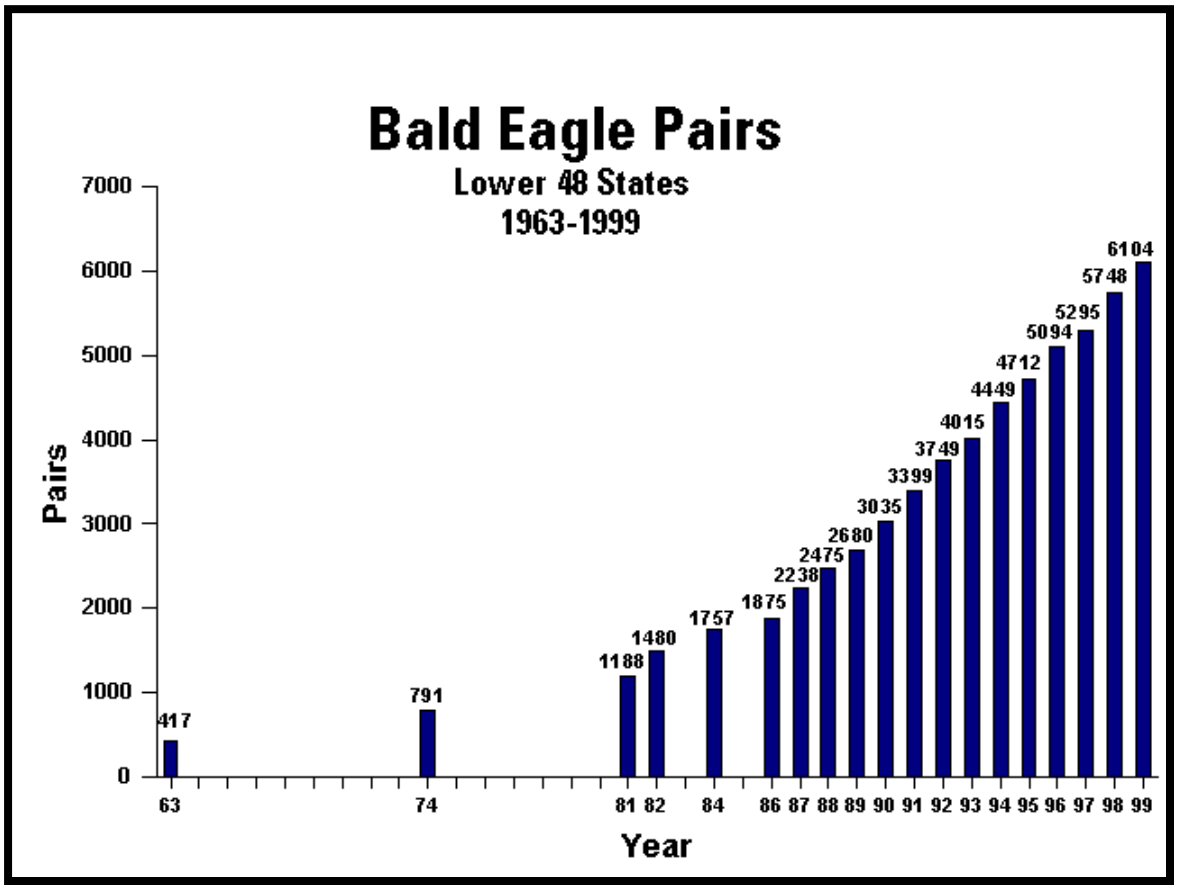


Figure 7. Pairs of nesting bald eagles in the lower 48 states, 1963 – 1999 (USFWS 2003).

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.

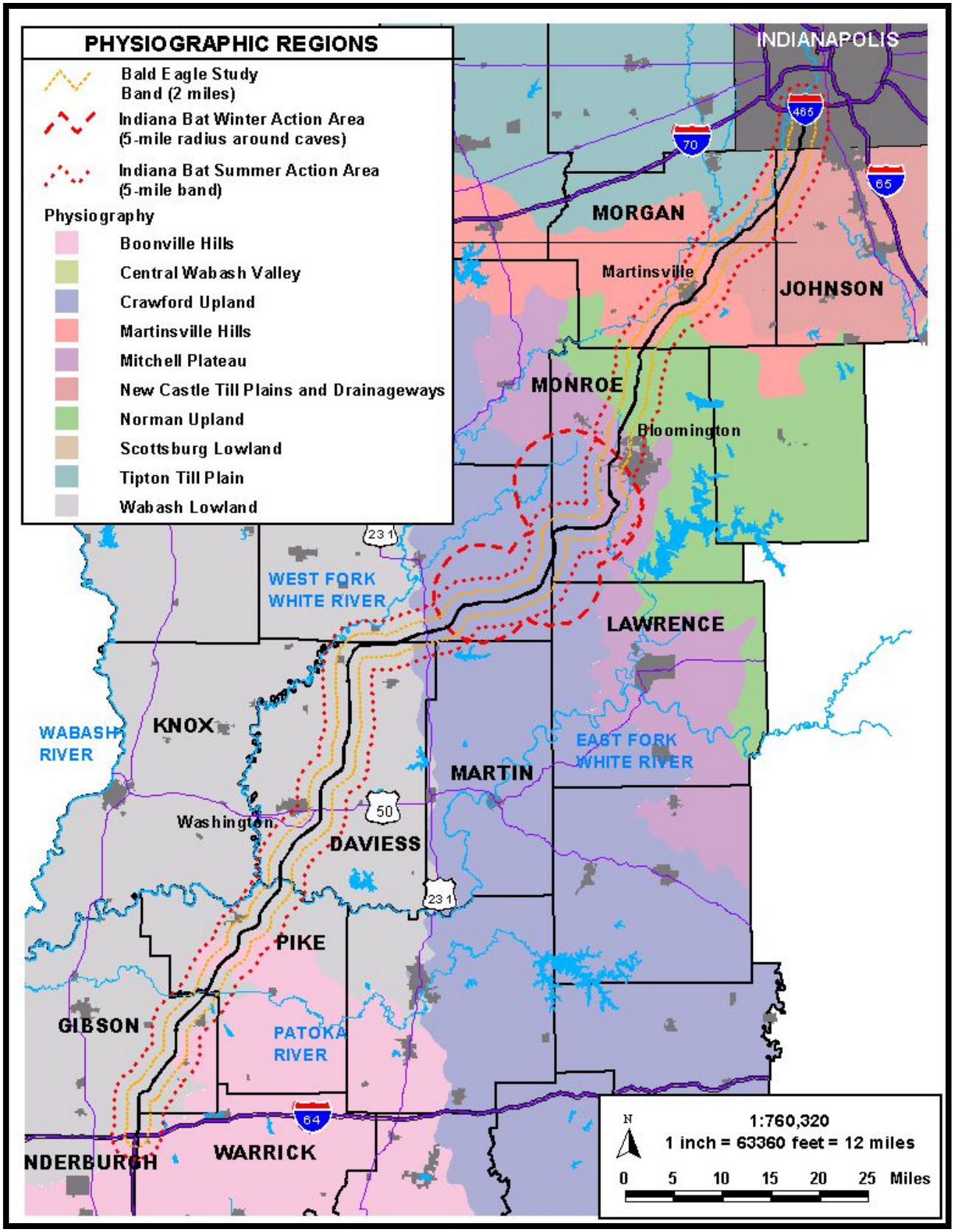


Figure 8. Physiographic regions (Gray 2000) and species Action Areas for the proposed I-69.

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,

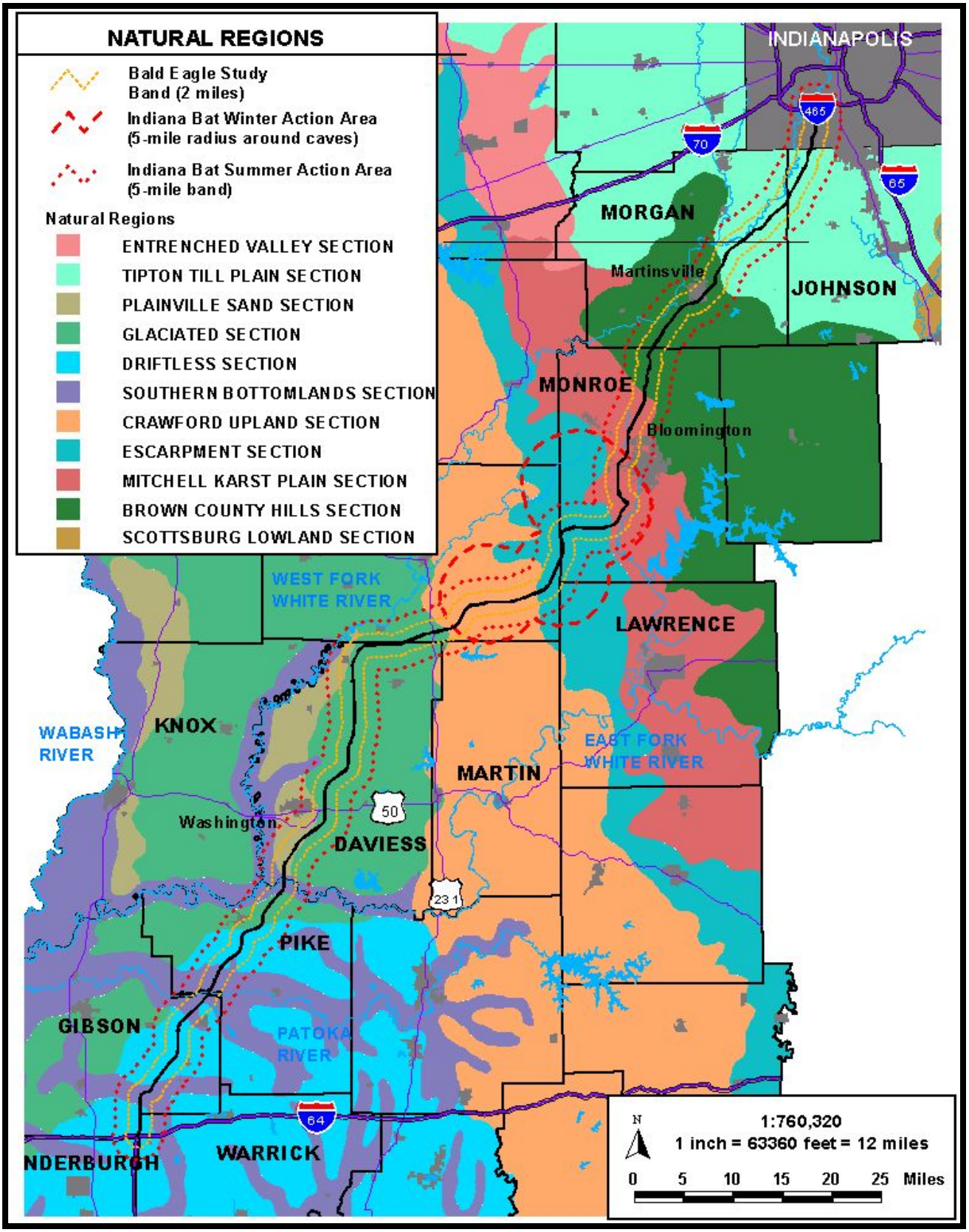


Figure 9. Natural regions (Homoya et al. 1985), species Action Areas, and proposed I-69.

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 autumn 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 spring of 2005, no Indiana bats were captured. Of the 16 caves surveyed during the autumn 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.

Priority 1 (P1): 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.

Priority 2 (P2): 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.

Priority 3 (P3): 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.

Priority 4 (P4): 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.. **These 15 known Indiana bat hibernacula located within the WAA sheltered a combined total hibernating population of 74,042 Indiana bats in 2005/2006** (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.

- Repeated human disturbance of hibernating bats – 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.
- Loss and degradation of swarming/staging habitat – 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.
- Degraded water quality – 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.
- Commercial and private timber harvesting –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.

Bald Eagles in the Action Area (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 $\geq$ 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. There were approximately 100 plus planned and currently expanding subdivisions still being built within the Action Areas. 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.

Summer Action Area:
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, 11 killed per calendar year, is not exceeded.

ATTENTION: 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, 3 killed/injured bald eagles during any five-year period, 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.

- Stream Relocation
  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. .

- Bridge Construction and Removal
  SPRING/SUMMER/FALL
  - Removal of an unknown number of concrete-girder bridges from existing roadways crossed by the proposed I-69 alignment could cause a loss of Indiana bat night roosts. 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.

- Water Quality Impacts
  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.

- Blasting near Known Hibernacula

  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.

- Destruction or Adverse Modification of Potential Hibernacula

  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

- Increased Mortality from Vehicle / Bat Collisions

  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.

- Increased Disturbance from Light / Noise / Vibration

  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.

- Development will remove, degrade, and fragment forest serving as summer roosting and foraging and fall swarming/spring staging habitat.
- 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).
- 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.
- 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.

- Increased Predation of Bats by Domestic Cats. – 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-6	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 area	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/diversity	0,5,6,7,9,	no
Annual summer mowing and herbicide us	Periodic noise, reduced vegetation and minimal reduction in insect abundanc	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 disturbanc	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					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		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		
		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																						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)	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 Foraging Habitat/Connectivity	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 Noise/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.

Part B: Amendment to Revised Tier 1 BO (Redacted)

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Offiee (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

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:

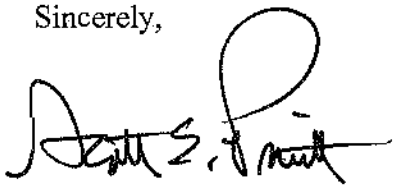
Pursuant to your April 11, 2011 request for reinitiation of eonsultation for the eonstruction, operation, and maintenance of Alternative 3C of Interstate 69 from Indianapolis to Evansville, Indiana and its effects on the Federally endangered Indiana bat (*Myotis sodalis*), the U.S. Fish and Wildlife 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 included 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.

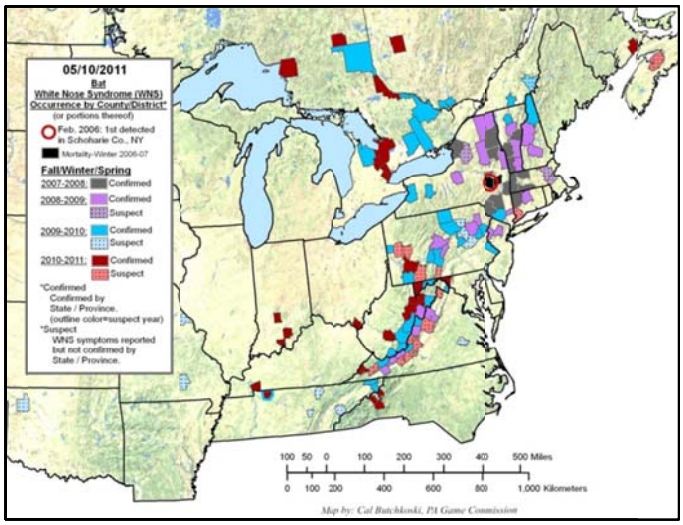


Figure 1.White Nose Syndrome Occurrence by County/District, Updated 05/10/2011.

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

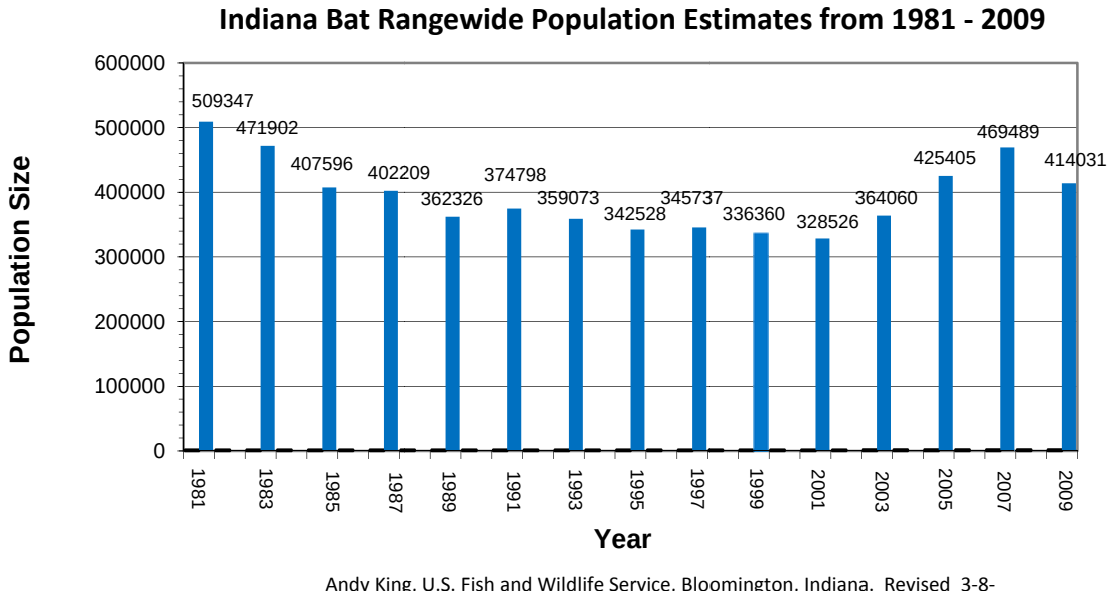


Figure 2. Indiana Bat Rangewide Population Estimates, Revised 2011.

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.

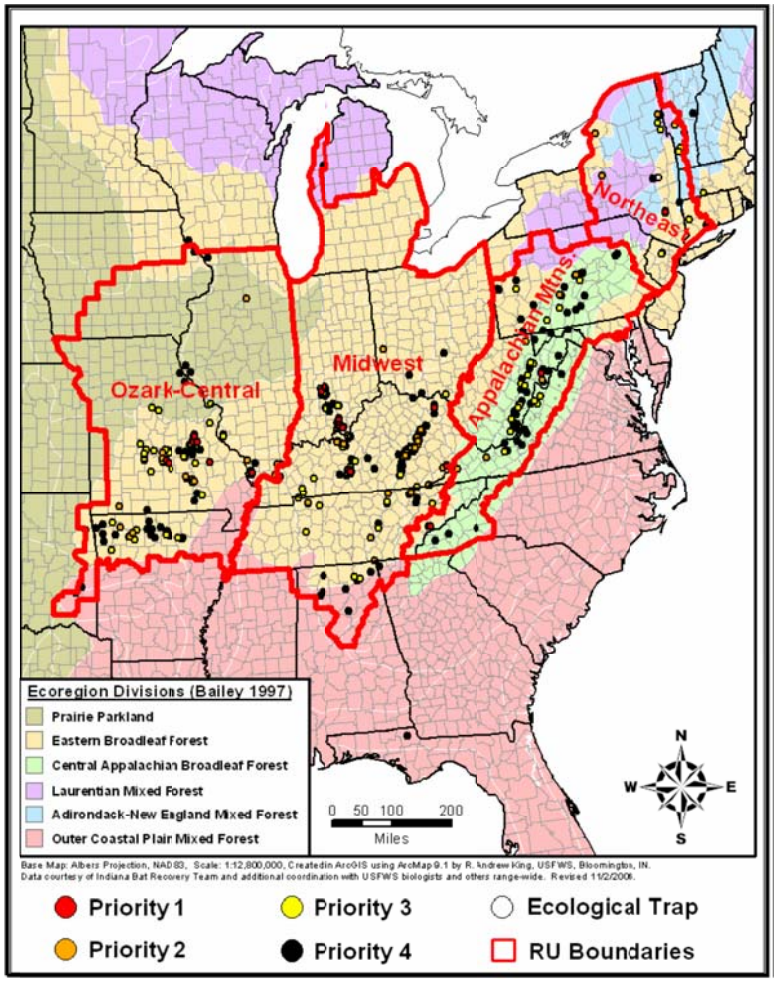


Figure 3. Proposed Indiana bat Recovery Units (Service 2007).

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, 22 killed per calendar year, is not exceeded.

ATTENTION: 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, 3 killed/injured bald eagles during any five-year period, 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:

<u>INDIANA BAT</u>

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-6	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 area	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/diversity	0,5,6,7,9,	no
Annual summer mowing and herbicide us	Periodic noise, reduced vegetation and minimal reduction in insect abundanc	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 disturbanc	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					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		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		
		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 Roosting 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 Foraging Habitat/Connectivity	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 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	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: Buckner E[1]	Buckner T[2]	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	[redacted] E	[redacted] T	Total Take of Bats†	Likely Form(s) of Take[3]
	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.