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February 17, 2017

Mr. Greg McKay
U.S. Army Corps of Engineers
Louisville District, Regulatory Branch
P.O. Box 59
Louisville, Kentucky 40201-0059

RE: Biological Opinion for the NALC Limestone Quarry project (LRL-2015-756) affecting the Indiana bat in Cloverdale, Putnam County, Indiana

Dear Mr. McKay:

This document transmits the U.S. Fish and Wildlife Service's (Service's) final Biological Opinion (BO) based on our review of the NALC limestone quarry project that may impact the Indiana bat (*Myotis sodalis*) under section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation was received on February 9, 2017. The Biological Opinion is based on information provided in the Section 404 Individual Permit Application Package, NALC LLC Northern Reserves Property, Putnam County (Initiation Package), other available literature, and information provided in the Service's final 4(d) rule for northern long-eared bats (*Myotis septentrionalis*), which was published in the *Federal Register* (81FR 1900) on January 14, 2016. A complete administrative record of this consultation is on file at the Service's Indiana Field Office.

The enclosed BO addresses effects of the project, which the U.S. Army Corps of Engineers determined were "likely to adversely affect" the Indiana bat and northern long-eared bat. The Service's 4(d) rule for the northern long-eared bat exempts the take of northern long-eared bats from the section 9 prohibitions of the ESA for certain specific activities. Thus any take of northern long-eared bats occurring in conjunction with these activities that complies with the conservation measures, as necessary, is exempted from section 9 prohibitions by the 4(d) rule, and does not require incidental take authorization. The Service completed a biological opinion on our action of finalizing and implementing the 4(d) rule. The biological opinion allows for streamlined consultation to meet section 7 requirements for all federal agency actions that may affect the northern long-eared bat, provided the agencies follow the criteria in the 4(d) rule and the biological opinion.

Since the proposed actions are consistent with the intra-Service consultation for the final 4(d) rule a separate consultation is not required and the northern long-eared bat was not addressed further in the biological opinion.

This BO specifically covers the NALC limestone quarry project for which the Service concurred was likely to adversely affect the Indiana bat. This opinion provides an effects and jeopardy analysis based upon anticipated incidental take as a result of this project. After reviewing the status and environmental baseline of the Indiana bat and an analysis of potential effects of the actions to the species, it is our determination that this project is not likely to jeopardize the continued existence of the Indiana bat.

This concludes formal consultation on the NALC limestone quarry project and precludes the need for additional consultation as required under section 7 of the Endangered Species Act of 1973, as amended. If, however, new information on endangered species within the proposed project area becomes available or if significant changes are made to ongoing projects, or if you have questions regarding the BO, then please contact Marissa Reed at (812) 334-4261 ext. 1215 or Marissa_Reed@fws.gov.

Sincerely,

Scott E. Pruitt
Field Supervisor

Enclosure

Biological Opinion

and

Incidental Take Statement

for the

Effects of the NALC Limestone Quarry Project on the Endangered Indiana Bat (*Myotis sodalis*) Cloverdale, Putnam County, Indiana

Prepared by:
U.S. Fish and Wildlife Service
Indiana Ecological Services Field Office
620 South Walker Street
Bloomington, Indiana 47403

February 17, 2017

TABLE OF CONTENTS

EXECUTIVE SUMMARY 4

INTRODUCTION 4

CONSULTATION HISTORY 6

BIOLOGICAL OPINION 7

- DESCRIPTION OF THE PROPOSED ACTION 7
  - Action Area 7
  - Conservation Measures 7
- STATUS OF THE SPECIES 8
  - Species Listing and Critical Habitat 8
  - Indiana Bat Life History 8
  - Range and Distribution 10
  - Population Status and Threats 15
- ENVIRONMENTAL BASELINE 23
  - Status of the Indiana Bat in the Action Area 23
  - Factors Affecting Indiana Bat Environment within the Action Area 23
- EFFECTS OF THE ACTION 24
  - Analysis of the Effects of the Action 25
  - Indiana Bat Response to the Proposed Action 26
- CUMMULATIVE EFFECTS 26
- CONCLUSION 27

INCIDENTAL TAKE STATEMENT 27

- AMOUNT OR EXTENT OF TAKE 28
- EFFECT OF THE TAKE 28
- REASONABLE AND PRUDENT MEASURES 28
- TERMS AND CONDITIONS 28

CONSERVATION RECOMMENDATIONS 29

REINITIATION NOTICE 30

LITERATURE CITED 31

LIST OF FIGURES

Figure 1. Generalized Indiana bat annual chronology. 9
Figure 2. Indiana bat current range and Recovery Units. 12
Figure 3. Rangewide Indiana bat population estimates 1981-2015. 14

LIST OF TABLES

Table 1. Rangewide Indiana bat population estimate, summarized by Recovery Unit. 13

EXECUTIVE SUMMARY

This Biological Opinion was issued to the U.S. Army Corps of Engineers and analyzed the effects of the NALC limestone quarry project in Cloverdale, Putnam County, Indiana on the federally endangered Indiana bat (*Myotis sodalis*). The individual site-specific consultation under Section 7 of the Endangered Species Act was used to address one proposed project. This consultation analyzed the direct, indirect, and cumulative impacts from the quarry project on Indiana bats.

The Indiana bat was assumed to be present at the project site based on the availability of suitable roosting and foraging habitat. Since the proposed project may have an impact on the environment where a listed species or critical habitat is present a biological assessment for the construction of the NALC limestone quarry project was prepared.

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 United States Code [USC] §1536), requires Federal agencies (U.S. Army Corps of Engineers in this case) to insure that their actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat that has been designated for those species. In addition, under section 7(a)(1) of the Endangered Species Act, all federal agencies are required to carry out programs for the conservation of federally listed species. This biological opinion satisfies the U.S. Army Corps of Engineer's section 7(a)(2) consultation requirement.

The Service concluded that the effects of the NALC limestone quarry project are not likely to jeopardize the Indiana bat and no critical habitat will be affected.

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion based on our review of the Section 404 Individual Permit Application Package, NALC LLC Northern Reserves Property, Putnam County (hereafter referred to as the Initiation Package). The Initiation Package was received at the Service's Indiana Ecological Services Field Office (INFO) on February 9, 2017 as part of a letter requesting us to initiate formal conference on potential adverse effects on the Indiana bat and northern long-eared bat. The U.S. Army Corps of Engineers (USACE) determined, and the Service concurred, that activities addressed in the Initiation Package may affect, likely to adversely affect the Indiana bat and northern long-eared bat. The Service has issued a 4(d) rule for northern long-eared bats that provides take exemptions for some activities, which includes those required for the proposed action. Therefore, this biological opinion addresses one species, the Indiana bat.

This biological opinion was prepared in accordance with section 7(a)(2) of the Endangered Species Act of 1973 (ESA), 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 biological opinion covers the proposed action which includes removal of 47.4 acres of suitable Indiana bat habitat associated with construction of the NALC limestone quarry project in Cloverdale, Putnam County, Indiana.

4(d) Rule for the NLEB

On January 14, 2016, the Service published a species-specific rule pursuant to section 4(d) of the ESA for the northern long-eared bat (81FR 1900). Section 4(d) of the ESA states that:

Whenever any species is listed as a threatened species ... the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species (16 U.S.C. 1533(d)).

The Service's 4(d) rule for the northern long-eared bat exempts the take of northern long-eared bats from the section 9 prohibitions of the ESA, as follows:

(1) Incidental take that is outside the white nose syndrome zone.
(2) Incidental take that is inside the white nose syndrome zone, provided these activities:
    a. Occur more than 0.25 mile (0.4 km) from a known, occupied hibernacula;
    b. Avoid cutting or destroying known, occupied roost trees during the pup season (June 1–July 31); and
    c. Avoid cutting or destroying any trees within a 150 foot (45 meter) radius of known, occupied roost trees during the pup season (June 1–July 31).
(3) Removal of hazard trees (no limitations).
(4) Purposeful take that results from
    a. Protection of human health and safety;
    b. Removal of bats from within human structures; and

Thus any take of northern long-eared bats occurring in conjunction with these activities that complies with the conservation measures, as necessary, is exempted from section 9 prohibitions by the 4(d) rule, and does not require incidental take authorization.

However, 4(d) rules do not afford exemption from the ESA's section 7 procedural requirements in and of themselves. Therefore, the Service completed a biological opinion on the Service's action of finalizing and implementing the 4(d) rule. The biological opinion allows for streamlined consultation to meet section 7 requirements for all federal agency actions that may affect the northern long-eared bat, provided the agencies follow the criteria in the 4(d) rule and the biological opinion.

The Service has reviewed the project information submitted February 16, 2017 for the NALC limestone quarry project and your determination that the proposed action will not result in any prohibited incidental take. This project may affect the northern long-eared bat; however, there are no effects beyond those previously disclosed in the Service's programmatic biological opinion for the final 4(d) rule dated January 5, 2016. Any taking that may occur incidental to this

project is not prohibited under the final 4(d) rule (50 CFR §17.40(o)). This project is consistent with the description of the proposed action in the programmatic biological opinion, and the 4(d) rule does not prohibit incidental take of the northern long-eared bat that may occur as a result of this project. Therefore, the programmatic biological opinion satisfies the USACE's responsibilities under ESA section 7(a)(2) relative to the northern long-eared bat for this project. Please keep in mind that you must report any departures from the plans submitted; results of any surveys conducted; or any dead, injured, or sick northern long-eared bats that are found to this office.

CONSULTATION HISTORY

The Service began coordination with USACE in November 2016. A chronological summary of coordination events and actions associated with this consultation is presented below.

November 14, 2016 – INFO received the USACE Joint Public Notice announcing the open comment period for the proposed NALC limestone quarry project in Cloverdale, Putnam County, Indiana.

November 22, 2016 – INFO responded to the joint public notice recommending presence/probable absence surveys to determine if listed bats are present at the project site. Alternatively, presence could be assumed and incidental take authorization could be requested through either the Section 7 or Section 10 consultation process.

January 5, 2017 – INFO received the *Tree Survey and Habitat Inspection Report – NALC Limestone Quarry* completed by Williams Creek Consulting to determine if the project site contained suitable Indiana bat habitat.

January 9, 2017 – INFO received the compensatory mitigation plan for stream and wetland impacts.

January 12, 2017 – INFO provided comments on the habitat report and compensatory mitigation plan.

January 30, 2017 – Meeting held at USACE to discuss potential impacts to listed bats from the proposed project and steps to complete consultation. Parties in attendance include representatives from NALC, Civil Engineering Consultants, Inc., Natural Resource Consulting, Inc., Indiana Department of Environmental Management, USACE, and INFO. The parties agreed that additional information about total impacts at the project site was needed to determine appropriateness of proposed compensatory mitigation.

February 1, 2017 – INFO received additional documentation from Civil Engineering Consultants, Inc. detailing project impacts and proposed compensatory mitigation.

February 9, 2017 – INFO received email from USACE requesting formal consultation for the NALC limestone quarry project. The USACE's email included the initiation package describing potential impacts to Indiana and northern long-eared bats.

February 10, 2015 – INFO sent the USACE an email acknowledging receipt of their request and initiation package and that formal consultation on the Indiana and northern long-eared bat had been initiated (starting on 9 February) on the NALC limestone quarry project.

February 16, 2017 – INFO received streamlined consultation form for the northern long-eared bat from the USACE.

February 16, 2017 – INFO submits draft biological opinion to the USACE for review.

February 17, 2017 – INFO issued its final biological opinion to the USACE.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." The "action area" is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present Federal, State, or private activities, as well as the cumulative effects of reasonably certain future State or private activities within the action area.

The federal action being evaluated in this biological opinion is the USACE's issuance of a Clean Water Act section 404 (CWA 404) permit for wetland and stream impacts resulting from construction of the NALC limestone quarry project. The proposed project includes a quarry pit, grinding plant, stockpile and overburden areas, and berms. Impacts from the project include discharge of fill into 9,712 linear feet of ephemeral stream and 0.075 acre wetland, and 47.4 acres of tree clearing.

Action Area

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 purposes of this biological opinion, the Action Area encompasses the 181 acre project site located in Cloverdale, Putnam County, Indiana.

Conservation Measures

NALC has incorporated conservation measures into the proposed project; these measures are designed to avoid, minimize, and mitigate impacts of the proposed action on the Indiana bat.

The Service has analyzed the effects of the proposed action based on the assumption that all conservation measures will be implemented. A summary of the conservation measures follows.

1) Avoidance Measures – direct take of Indiana bats will be avoided by conducting tree clearing activities between October 1 and March 31 when the bats are not present at the site. In addition, the project was redesigned to avoid 5.5 acres of suitable habitat.

2) Minimization Measures – indirect take will be minimized by conducting phased tree clearing over 15 years. Phase 1 contains 16 acres and will be cleared by March 31, 2017. Phase 2 includes 6.9 acres and will be cleared in 2022 (either from January 1 – March 31, 2022 or from October 1 – December 31, 2022). Phase 3, which has 22.5 acres, will be cleared in 2027 (either from January 1 – March 31, 2027 or from October 1 – December 31, 2027). Phase 4 consists of 2 acres and will be cleared in 2032 (either from January 1 – March 31, 2032 or from October 1 – December 31, 2032).

2) Mitigation Measures – To mitigate for the impacts of incidental take associated with the project, NALC will protect 62.5 acres of suitable summer habitat and restore 16.3 acres of forested area at the established mitigation site within the Mosquito Creek watershed. These mitigation measures will be implemented concurrent with the proposed project, and as approved by the Service.

STATUS OF THE SPECIES

Species Listing and Critical Habitat

The Indiana bat was 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]). In 1973, the Endangered Species Preservation Act was subsumed by the Endangered Species Act and the Indiana bat was extended full protection under this law. Critical habitat was designated for the species on September 24, 1976 (41 FR 14914). Thirteen hibernacula, including 11 caves and two mines in six states, were listed as critical habitat.

The Indiana bat is a temperate, insectivorous, migratory bat that hibernates in caves and mines in the winter, and spends the summer in wooded areas. A description of the species physical appearance and a discussion of taxonomy can be found in the Indiana Bat Draft Recovery Plan: First Revision (USFWS 2007).

Indiana Bat Life History

The Indiana Bat Draft Recovery Plan: First Revision (USFWS 2007) provides a comprehensive discussion of Indiana bat life history. A summary of the life history follows (citation for information in the summary is USFWS 2007 unless otherwise noted).

Annual Chronology

A generalized chronology of the annual cycle in Indiana bats is found in Figure 1. Note that this figure depicts peaks for each phase of annual chronology, but does not capture outliers.

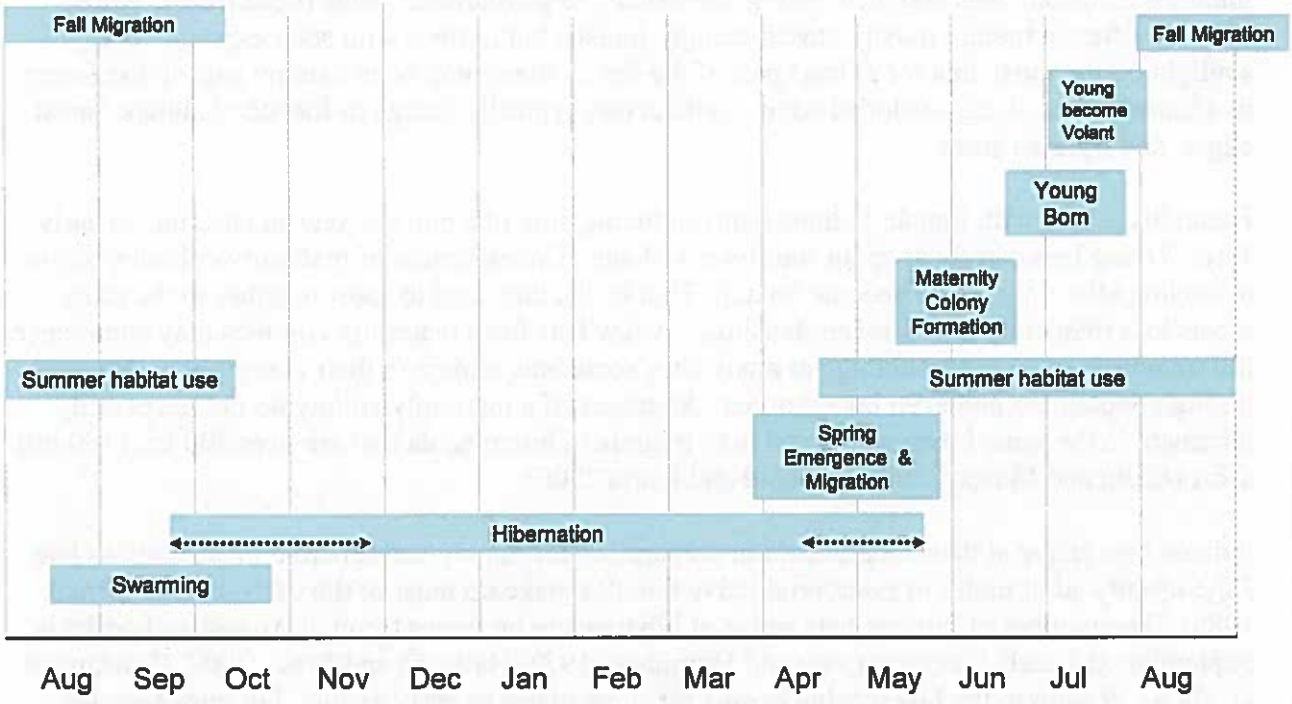

FIGURE 1. GENERALIZED INDIANA BAT ANNUAL CHRONOLOGY.

In winter Indiana bats hibernate in caves or mines, often with other species. The period of hibernation varies across the range of the species, among years, and among individuals. On a rangewide basis, the months of October through April capture the hibernation period of most individuals.

In spring, Indiana bats emerge from hibernation. Female Indiana bats emerge first, generally late March and through April, and most males emerge later. The timing of annual emergence varies, depending in part on latitude and annual weather conditions. Shortly after emerging from hibernation, females become pregnant via delayed fertilization from the sperm that has been stored in their reproductive tracts through the winter. Most reproductive females appear to initiate migration to their summer habitat quickly after emerging from hibernation. Females migrate to their traditional roost sites, where they find other members of their maternity colony. Members of the same maternity colony may come from many different hibernacula. Most documented maternity colonies have 50 to 100 adult female bats; average colony size of 80 adult females (Whitaker and Brack 2002) is a widely used estimate.

Female Indiana bats exhibit strong site fidelity to summer roosting and foraging areas; that is,

they return to the same summer range annually to bear their young. Female Indiana bats form maternity colonies in forested areas where they bear and raise their pups. Maternity colony habitats include riparian forests, bottomland and floodplain habitats, wooded wetlands, and upland forest communities. Maternity roost sites are most often under the exfoliating bark of dead trees that retain peeling bark. Live trees, especially shagbark hickory, are also used if they have flaking bark under which the bats can roost. Primary roosts, those used frequently by large numbers of female bats and their young, are usually large diameter snags (dead trees). Roost trees are often in mature mostly closed-canopy forests, but in trees with solar exposure (i.e., sunlight on the roost area for at least part of the day) – these may be in canopy gaps in the forest, in a fenceline, or along a wooded edge. Indiana bats typically forage in forested habitats, forest edges, and riparian areas.

Fecundity is low with female Indiana bats producing only one pup per year in late June to early July. Young bats can fly at about four weeks of age. Cohesiveness of maternity colonies begins to decline after young bats become volant. That is, the bats tend to roost together in the same roosts less frequently and at lower densities. A few bats from maternity colonies may commence fall migration in August, although at many sites some bats remain in their maternity colony area through September and even into October. Members of a maternity colony do not necessarily hibernate in the same hibernacula, and may migrate to hibernacula that are over 300 km (190 mi) apart (Kurta and Murray 2002, Winhold and Kurta 2006).

Indiana bats arrive at their hibernacula in preparation for mating and hibernation as early as late July; usually adult males or nonreproductive females make up most of the early arrivals (Brack 1983). The number of Indiana bats active at hibernacula increases through August and peaks in September and early October (Cope and Humphrey 1977, Hawkins and Brack 2004, Hawkins et al. 2005). Return to the hibernacula begins for some males as early as July, but most females arrive later. After fall migration, females typically do not remain active outside the hibernaculum as long as males. Males may continue swarming through October in what is believed to be an attempt to breed with late arriving females. 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 (Hall 1962). 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.

Swarming continues for several weeks and mating may occur on cave ceilings or near the cave entrance during the latter part of the period. Limited mating activity occurs throughout the winter and in spring before the bats leave hibernation (Hall 1962). Adult females store sperm through the winter and become pregnant via delayed fertilization soon after emergence from hibernation. Young female bats can mate in their first autumn and have offspring the following year (although how many actually do so is variable), whereas males may not mature until the second year.

Range and Distribution

Indiana bats are found over most of the eastern half of the United States (current range is depicted by the outer red line in Figure 2). The recovery program for the Indiana bat delineates

four Recovery Units (RUs): the Ozark-Central, Midwest, Appalachian Mountains, and Northeast RUs (Figure 2; see USFWS 2007 for explanation of RU boundaries). The proposed project would be constructed within the Midwest RU, and we assume that bats impacted by the project will be from the Midwest RU.

In 2015, approximately 35% of Indiana bats (185,720 of 523,636) hibernated in caves in southern Indiana. Other states which supported populations of over 50,000 hibernating Indiana bats included Illinois, Missouri, and Kentucky. Other states within the current winter range of the Indiana bat include Alabama, Arkansas, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia. Approximately 50% of the population hibernated in the Midwest Recovery Unit (Table 1). The 2015 population estimate (523,636) is almost 400,000 bats less than when the species was listed as endangered in 1967 (approximately 900,000).

The known summer distribution of the Indiana bat covers a broader geographic area than its winter distribution. For more detailed information on current summer distribution reference Appendix 2 in the Indiana Bat Draft Recovery Plan: First Revision (USFWS 2007); Appendix 2 details the distribution of approximately 270 known Indiana bat maternity colonies. Based on an estimated total Indiana bat population of 523,636 in 2015 and an average maternity colony size of 80 adult females, we estimate that there are about 6,545 maternity colonies of Indiana bats. Of these, we know the location of approximately 270 colonies, which is less than 5% of the colonies we assume to be present.

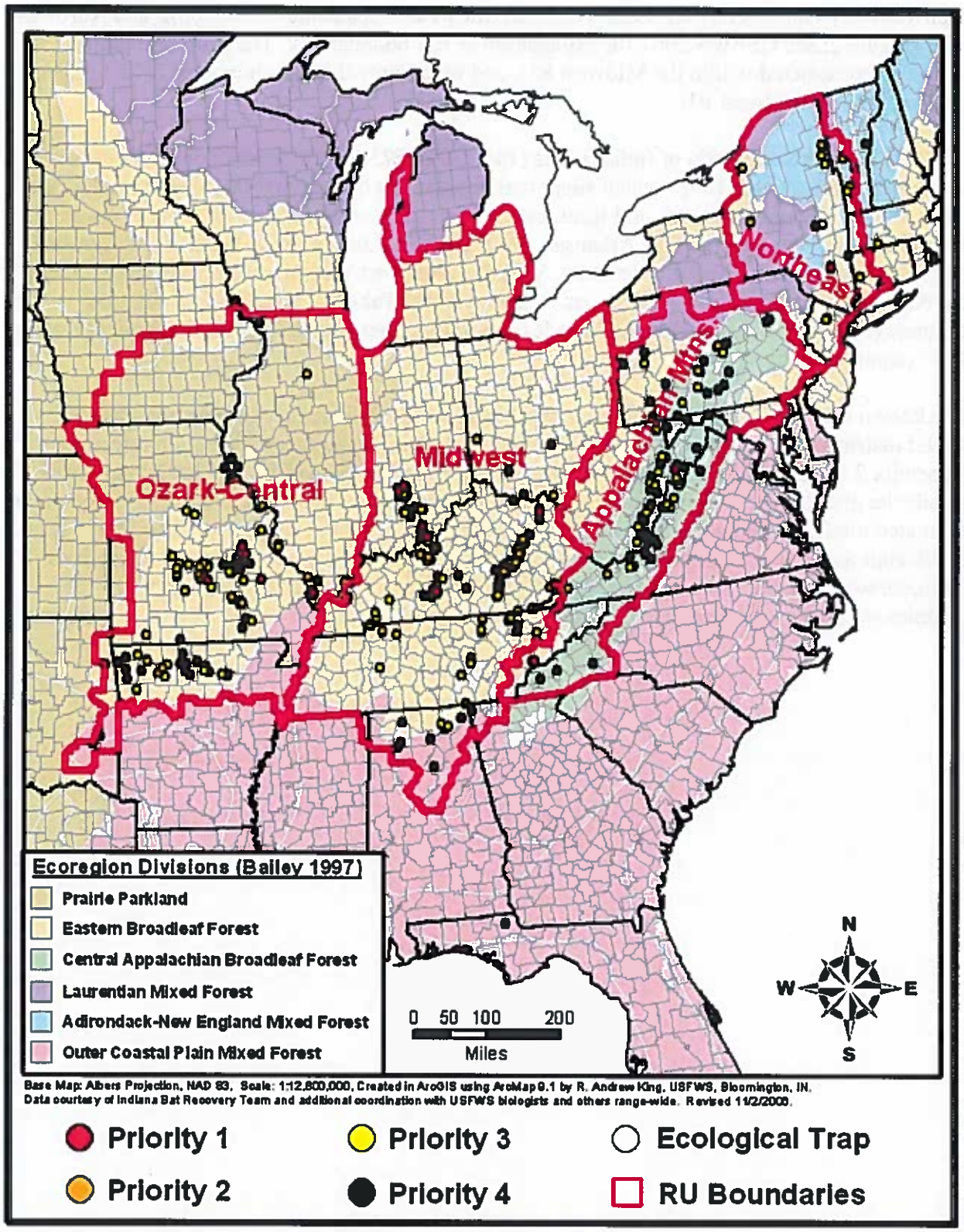

FIGURE 2. INDIANA BAT CURRENT RANGE (DELINEATED BY OUTER RED LINE) AND RECOVERY UNITS.

TABLE 1. 2015 POPULATION ESTIMATES FOR THE INDIANA BAT BY RECOVERY UNIT

IBat Recovery Unit	State	2007	2009	2011	2013	2015	% Change from 2013	% of 2015 Total
Ozark-Central	Illinois	53,824	53,342	61,239	58,840	56,055	-4.7%	10.7%
	Missouri	183,304	181,097	182,852	184,245	185,693	0.8%	35.5%
	Arkansas	1,821	1,480	1,206	856	1,389	62.3%	0.3%
	Oklahoma	0	0	13	5	5	0.0%	0.0%
	Total	**238,949**	**235,919**	**245,310**	**243,946**	**243,142**	**-0.3%**	**46.4%**
Midwest	Indiana	238,068	213,244	225,477	226,572	185,720	-18.0%	35.5%
	Kentucky	71,250	57,325	70,598	62,233	66,024	6.1%	12.6%
	Ohio	7,629	9,261	9,870	9,259	4,809	-48.1%	0.9%
	Tennessee	2,929	1,657	1,791	2,369	2,551	7.7%	0.5%
	Alabama	258	253	261	247	247	0.0%	0.0%
	SW Virginia	188	217	307	214	137	-36.0%	0.0%
	Michigan	20	20	20	20	20	0.0%	0.0%
	Total	**320,342**	**281,977**	**308,324**	**300,914**	**259,508**	**-13.8%**	**49.6%**
Appalachia	West Virginia	14,745	17,965	20,296	3,845	2,373	-38.3%	0.5%
	E Tennessee	5,977	11,058	11,096	13,200	2,401	-81.8%	0.5%
	Pennsylvania	1,038	1,035	516	120	24	-80.0%	0.0%
	Virginia	535	514	556	418	460	10.0%	0.1%
	North Carolina	0	1	1	1	0	-100.0%	0.0%
	Total	**22,295**	**30,573**	**32,465**	**17,584**	**5,258**	**-70.1%**	**1.0%**
Northeast	New York	52,779	33,172	15,654	17,772	15,564	-12.4%	3.0%
	New Jersey	659	619	409	448	111	-75.2%	0.0%
	Vermont	325	64	61	53	53	0.0%	0.0%
	Total	**53,763**	**33,855**	**16,124**	**18,273**	**15,728**	**-13.9%**	**3.0%**
Rangewide Total:		**635,349**	**582,324**	**602,223**	**580,717**	**523,636**	**-9.8%**	**100%**

Population Status and Threats

This section will include a discussion of status of the Indiana bat and threats to the species rangewide. Within this rangewide context, we will also comment on the status and threats in the Midwest Recovery Unit, which is where this project will take place.

Population Status

The 2015 rangewide population estimate of Indiana bats was 523,636 individuals, based on winter hibernacula survey information compiled by the Service (Table 1). Figure 3 provides the rangewide Indiana bat population estimates from 1981-2015.

Generally, the Indiana bat population (rangewide) decreased from the time of listing through the 1990s. From 2001 through 2007 the population increased, but has declined since. The population in the Midwest Recovery Unit has followed the same trend.

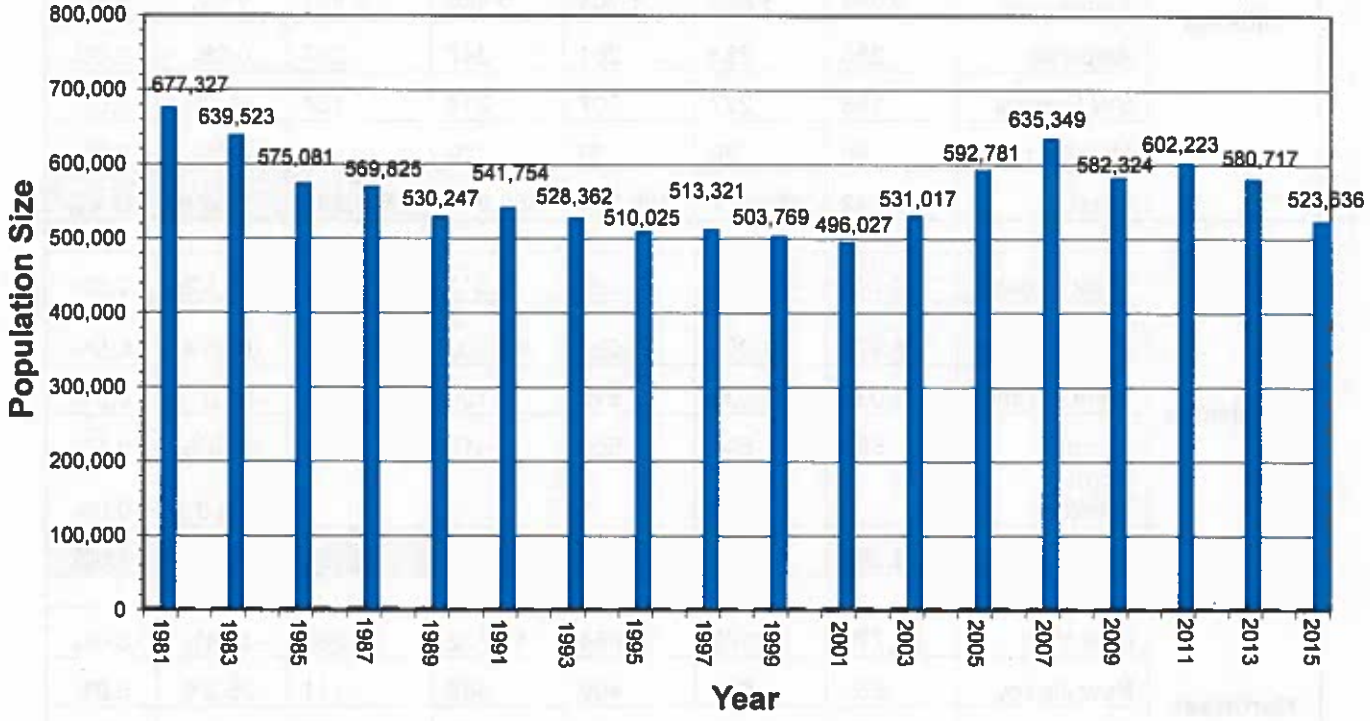

FIGURE 3. RANGEWIDE INDIANA BAT POPULATION ESTIMATES 1981-2015.

Threats

We categorize threats based on these five factors, consistent with current listing and recovery analyses under the Endangered Species Act:
A. The present or threatened destruction, modification, or curtailment of its habitat or range.
B. Overutilization for commercial, recreational, scientific, or educational purposes.
C. Disease or predation.
D. The inadequacy of existing regulatory mechanisms.
E. Other natural or man-made factors affecting its continued existence.

The draft revised Recovery Plan (USFWS 2007) includes a detailed discussion of threats. The following summary is based primarily on that document, with emphasis on the Midwest Recovery Unit. This summary also includes information that was not available at the time the draft revised plan was completed.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Destruction/Degradation of Hibernation Habitat

There are well-documented examples of modifications to Indiana bat hibernation caves that affected the thermal regime of the cave, and thus the ability of the cave to support hibernating Indiana bats, as summarized in the draft revised Recovery Plan (USFWS 2007). Generally, threats to the integrity of hibernacula have decreased since the time that Indiana bats were listed as endangered. Increasing awareness of the importance of cave microclimates to hibernating bats and regulatory authorities under the Endangered Species Act have lessened, but not eliminated, this threat. In addition to purposeful modifications, the threat of collapse in mines where Indiana bats hibernate, and the threat of inadvertent modifications to caves or natural catastrophes that can impact hibernacula remain.

Loss/Degradation of Summer Habitat, Migration Habitat, and Swarming Habitat

As discussed in the Recovery Plan (USFWS 2007), the Indiana bat requires forested areas for foraging and roosting. Loss of forest cover and degradation of forested habitats have been cited as contributing to the decline of Indiana bats (USFWS 1983, Gardner et al.1990, Garner and Gardner 1992, Drobney and Clawson 1995, Whitaker and Brack 2002). However, at a landscape level Indiana bat maternity colonies occupy habitats ranging from completely forested to areas of highly fragmented forest. Attempts to correlate forest cover with the presence of Indiana bats (typically maternity colonies) have generally not been successful. Clearly, forest cover is not a completely reliable predictor of where Indiana bat maternity colonies will be found on the landscape (Farmer et al. 2002). Nonetheless, trends in forest cover are of interest relative to Indiana bat, with increasing forest cover suggesting at least the potential for improved habitat conditions, as the species does rely on forested areas for both roosting and foraging outside the hibernation period. Conversely, in areas where almost all forest land has been lost, the absence of woodlands on the landscape certainly equates to less habitat than in prehistoric and early historic periods.

Throughout the range of the Indiana bat, there is less forest land now than there was prior to European settlement (Smith et al. 2003), particularly within the core of the species' range in the Midwest. Conversion to agriculture has been the largest single cause of forest loss. The conversion of floodplain and bottomland forests, recognized as high quality habitats for Indiana bats, has been a particular cause of concern (Humphrey 1978). More recently, since the 1950s, some marginal farmlands have been abandoned and allowed to revert to forest and there has been a net increase in forest land within the range of the Indiana bat, particularly in the Northeast (Smith et al. 2003). Forest cover has also increased within the Midwest Recovery Unit (Smith et al. 2003). Not only has the amount of forest cover increased since the 1950s, but also the average diameter of trees has increased (Smith et al. 2003), which may equate to an increased supply of suitable roost trees for Indiana bats.

Currently, the greatest single cause of conversion of forests within the range of the Indiana bat is urbanization and development (Wear and Greis 2002; U.S. Forest Service 2005, 2006), which results in permanent conversion to land uses generally unsuitable for Indiana bats. Indiana bats are known to use forest-agricultural interfaces for foraging. In contrast, Indiana bats appear to avoid foraging in highly developed areas. At a study site in central Indiana, Indiana bats avoided foraging in a high-density residential area (Sparks et al. 2005), although maternity roosts have been found in low-density residential areas (Belwood 2002). Duchamp (2006) found that greater amounts of urban land use was negatively related to bat species diversity in north-central Indiana; several bat species, including the Indiana bat, were less likely to occur in landscapes with greater amounts of urban and suburban development. Development directly destroys habitat and fragments remaining habitat.

In summary, the relationship between forest cover at the landscape scale and Indiana bat populations is complex. Current trends toward increasing amounts of forest cover suggest that potential habitat for the Indiana bat may also be increasing. However, further study and monitoring will be required to determine if this potential habitat will be used and ultimately affect an increase in survival or productivity of Indiana bats.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Disturbance of Hibernating Bats

The original recovery plan for the species stated that human disturbance of hibernating Indiana bats was one of the primary threats to the species (USFWS 1983). The primary forms of human disturbance to hibernating bats result from cave commercialization (cave tours and other commercial uses of caves), recreational caving, vandalism, and research-related activities.

Progress has been made in reducing the number of caves in which disturbance threatens hibernating Indiana bats, but the threat has not been eliminated. Biologists throughout the range of the Indiana bat were asked to identify the primary threat at specific hibernacula "Human disturbance" was identified as the primary threat at 41 percent of Priority 1, 2 and 3 hibernacula combined. (Definitions for hibernacula priority numbers: Priority 1 - current and/or historically observed winter population ≥ 10,000 Indiana bats; Priority 2 - current or observed historic

population of 1,000 or greater but fewer than 10,000; Priority 3 - current or observed historic populations of 50-1,000 Indiana bats; Priority 4 - current or observed historic populations of fewer than 50 Indiana bats. See USFWS 2007 for additional information on hibernacula priority numbers.)

When only hibernacula in the Midwest Recovery Unit were considered, the proportion of sites where "human disturbance" was considered the primary threat was lower compared to rangewide, although it was still the primary threat that has been identified for Priority 1, 2, and 3 hibernacula combined. So, while it appears that the threat of human disturbance at hibernacula is less in the Midwest Recovery Unit compared to the rangewide threat, it remains a primary issue to be addressed in some important hibernacula.

Disturbance of Summering Bats

There are far fewer documented examples of disturbance of Indiana bats in summer due to "overutilization for commercial, recreational, scientific, or educational purposes," compared with impacts to hibernating bats. However, research-related disturbance of summering Indiana bats has been observed (USFWS 2007).

As of December 2007, there were approximately 30 active section 10(a)(1)(A) permits (research permits) for Indiana bats in Region 3 of the Service (which includes most of the Midwest Recovery Unit). As of January 2014, there are approximately 80 permits that are active (or in the process of renewal). Generally, there is more mist netting being conducted for Indiana bat surveys in the Midwest Recovery Unit (as well as other parts of the range) than at any time in the past. Much of this increase is associated with surveys to determine if Indiana bats are present at locations associated with proposed wind energy developments (see discussion below under Other Natural or Man-made Factors affecting Its Continued Existence), as well as other development projects. Mortality associated with mist netting and associated handling of bats has been observed. However, insuring that only qualified, permitted researchers conduct this work and follow proper holding and marking techniques minimizes potential for research-related mortality.

In addition to research, mortality of summering Indiana bats resulting from the felling of roost trees has been documented (USFWS 2007). Roost abandonment has been documented when heavy equipment was operated in the vicinity of roosts (Callahan 1993, Timpone 2004). Minimizing disturbance in the vicinity of known roost sites, and checking suitable sites prior to disturbance to determine if they are occupied, can help to avoid disturbance-related mortality.

Factor C. Disease or Predation

In the past, disease and predation have generally not been considered major threats to bat populations in general, or Indiana bats specifically (USFWS 2007). The emergence of white-nose syndrome (WNS) has changed that. WNS has caused recent catastrophic declines among multiple species of bats in eastern North America (Lorch et al. 2011, Cryan et al. 2013a) including large declines in Indiana bat populations (Turner et al. 2011). WNS is now recognized as the most significant threat to the Indiana bat.

Dead bats were first documented at four sites in eastern New York in the winter of 2006-2007. At the time, the cause of mortality was unknown but white fungus was observed on muzzles of many of the dead bats and the term "white-nose syndrome" was coined. WNS has since caused the death of an estimated 5.7 – 6.7 million bats of seven species, including the Indiana bat, across the eastern North America. Bat population declines due to WNS are one of the fastest declines of wild mammal populations ever observed (Cryan et al. 2010; Frick et al. 2010). Associated with the fungus *Pseudogymnoascus destructans* (Minnis and Linder 2013), the disease is named after the most obvious visible symptom of WNS which is the presence of a white fungus on the face, wing, or tail membranes of some affected animals (some do not exhibit visible fungus). [Note that when first identified the fungus was named *Geomyces destructans* (Gargas et al. 2009), but more recent phylogenetic analyses have demonstrated that the WNS fungus should be placed in the genus *Pseudogymnoascus* (Minnis and Linder 2013) and it has been reclassified].

WNS may affect behavioral changes in infected individuals. For example, at some WNS-affected sites a shift of hibernating bats from traditional winter roosts to roosts unusually close to hibernacula entrances has been observed. Bats have also been observed flying outside of hibernacula during winter (often during the day) at some affected sites. At some sites, bat carcasses (particularly of *Myotis lucifugus*, the little brown bat) have been found outside affected hibernacula. Many infected bats do not survive the winter. The exact processes by which the fungal skin infection lead to death are not known, but depleted fat reserves (i.e., starvation) contribute to mortality (Reeder et al. 2012, Warnecke et al. 2012) and dehydration may also have a role (Willis et al. 2011, Cryan et al. 2013b, Ehlman et al. 2013). It is also suspected that some of the affected bats that survive hibernation emerge in such poor condition that they do not survive the summer. Among those bats that do survive, it appears that productivity of female survivors may be negatively affected (Francl et al. 2012).

At the end of the 2012-2013 hibernating season, bats with WNS were confirmed in 22 states and five Canadian provinces (see http://www.whitenosesyndrome.org/ for most recent information). Turner et al. (2011) summarized mortality rates from WNS for six species of bats for five states (NY, PA, VT, VA, WV) at sites where WNS had been present for at least two years. They summarized data from 42 sites and saw an overall decline of 88% in the number of hibernating bats at WNS-affected sites, from a total of 412,340 bats (pre-WNS) to 49,579. Mortality varies among sites and among species (Turner et al. 2011). If current trends for spread and mortality at affected sites continue, WNS will drastically reduce the abundance of many species of hibernating bats in much of North America. We anticipate that WNS will continue to spread rapidly, moving through the Midwest, South and eventually Great Plains over the next couple of years. Simulations by Maher et al. (2012) predicted rapid expansion of WNS and infection of most counties with caves in the contiguous United States by winter 2105–2106.

The little brown bat, which was the most abundant cave-hibernating bat species in the Northeast prior to WNS, has declined by 91% in affected sites (Turner et al. 2011). Population modeling suggests a 99% chance of regional extirpation of the little brown bat in the Northeast within 16 years due to WNS (Frick et al. 2010).

Impacts of WNS on Indiana Bats

The Indiana bat, which is closely-related to the little brown bat, has also declined due to WNS. Turner et al. (2011) summarized data from 15 Indiana bat hibernation sites in five states (NY, PA, VT, VA, WV) (11 of the sites were in New York) where WNS had been present for at least two years. They documented an overall decline of 72% in the number of hibernating Indiana bats at those sites.

Impacts to Indiana bats have been variable among affected hibernacula. The following is an example of population counts in New York (at the sites with largest Indiana bat populations) when comparing the most recent counts to the last count conducted prior to signs of WNS at any given site, generally 2005 or 2007 counts (USFWS 2013):

- Haile's Cave — 100% decline from 685 bats in 2005 to 0 in 2010
- Williams Preserve Mine — 98.5% decline from 13,014 in 2007 to 190 in 2010
- Williams Lake Mine — 97.4% decline from 1,003 in 2007 to 26 in 2010
- Glen Park — 73.6% decline from 1,928 in 2007 to 509 in 2010
- Williams Hotel Mine — 66.5% decline from 24,317 in 2007 to 8,152 in 2010
- Jamesville — 20.7% decline from 2,932 in 2007 to 2,324 in 2009
- Barton Hill Mine — 13.7% increase from 9,393 in 2007 to 10,678 in 2010

The Northeast Recovery Unit, where WNS was first observed in the winter of 2006-2007, lost over 70% of its Indiana bats between 2007 and 2015. At the time dead bats were first observed in the winter of 2006-2007, we do not know how long the (previously unidentified) fungus, *Pseudogymnoascus destructans,* had been present in affected sites. Based on subsequent observations as WNS spread, it appears that the arrival of the fungus in an area may precede large-scale fatality of bats by several years. Between 2011 and 2015 the Appalachian Recovery Unit, where WNS was confirmed in the winter of 2008-2009, declined by 84%. The Midwest Recovery Unit, where WNS was confirmed in the winter of 2010-2011, declined by 16% between 2011 and 2015. The Ozark-Central Recovery Unit, where WNS was confirmed in the winter of 2011-2012, declined by less than 1% between 2013 and 2015.

Thogmartin et al.'s (2013) model of the impacts of WNS on Indiana bat populations suggested that WNS will cause local and regional extirpation of some wintering populations of Indiana bats, and overall population declines exceeding 86%. However, they note a number of important limitations and sources of uncertainty that could result in actual declines being less or more severe compared to projections. One uncertainty is whether or not Indiana bats will develop any degree of immunity, genetic resistance, or behavioral tolerance to WNS.

Langwig et al. (2012) found that in Indiana bats and little brown bats, species that cluster in tight aggregations during hibernation, the declines due to WNS were equally severe across a large range of colony sizes, suggesting that WNS transmission is not density-dependent in these species. In little brown bats, after populations had declined they found an increase in the proportion of little brown bats that were roosting individually. This change in behavior could potentially reduce transmission of WNS among surviving little brown bats. Changes in sociality (i.e., clustering behavior) were less apparent in Indiana bats, possibly putting this species at higher continued risk of WNS transmission (i.e., impacts of WNS may be less likely to abate over time).

Thogmartin et al. (2012a) suggested that all hibernating populations of Indiana bats are currently susceptible to WNS; throughout the range of the species there are infected source populations within the known migration distance for individual Indiana bats. They projected that all sizeable complexes of hibernating Indiana bat populations may be affected by WNS as early as 2016. Observed spread (see map at http://www.whitenosesyndrome.org/about/where-is-it-now) suggests that Thogmartin et al.'s (2012a) model is not overly pessimistic. WNS now has been confirmed in all Indiana bat RUs and we anticipate that WNS will continue to radiate out to new sites within the more recently affected RUs, eventually reaching all major hibernacula for the species. Based on observations in the Northeast, the area that has been affected the longest and has the best data on mortality, we anticipate that all RUs will eventually experience the level of decline that has been documented in the Northeast.

Ultimately, how WNS will impact Indiana bat populations in the long term is not known, although current data suggest that those impacts will be severe. The impacts of WNS in the Northeast and models of spread and impacts (e.g. Thogmartin et al 2012a, 2012b, 2013) suggest that local and regional extirpations of some populations of Indiana bats should be expected. However, Thogmartin et al. (2012a) noted that the causative processes associated with WNS spread and associated impacts are not well understood. WNS may not cause the same consequences on wintering bat populations (e.g., mortality may be less) as the disease moves west and south. Ehlman et al. (2013) suggested that bat populations experiencing shorter southern winters could persist longer than their northern counterparts when faced with WNS; modeling by Flory et al. (2012) also suggested that mortality may be lower in some areas due to different environmental conditions. It has been documented that bats held in captivity and given supportive care can recover from the wing damage caused by *P. destructans* (Meteyer et al. 2011). Healing of wing membranes has also been observed in free-ranging bats caught during the active season (following WNS infection during hibernation) (Dobony et al. 2011, Fuller et al. 2011). However, the recovery process is physiologically challenging (Cryan et al. 2013a). Current thinking is that it is likely that *P. destructans*, the fungus that causes WNS, was accidentally translocated from Europe to the U.S. (Blehert 2012). Although the fungus is widespread among bats in Europe, bat mortality events similar to those in North America have not been observed in Europe (Wibbelt et al. 2010). Researchers hypothesize that bats in Europe may be more immunologically or behaviorally resistant to the fungus than their congeners in North America because they potentially coevolved with the fungus. Whether or not European bats have immunological resistance to WNS has not been determined. Likewise it is unknown if North American bats will develop resistance, although immunologically resistant individuals have not been detected to date (Moore et al. 2013).

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Listing of the Indiana bat in 1967 under the Endangered Species Preservation Act brought attention to the dramatic declines in the species' populations and led to regulatory and voluntary measures to alleviate disturbance of hibernating bats (Greenhall 1973). Subsequent listing under the ESA in 1973 led to further protection of hibernacula. The Federal Cave Resources Protection Act of 1988 (18 U.S.C. 4301-4309; 102 Stat. 4546) was passed to "secure, protect, and preserve significant caves on Federal land" and to "foster increased cooperation and exchange of

information between governmental authorities and those who utilize caves located on Federal lands for scientific, educational, or recreational purposes." This law provides additional protections for hibernacula located on Federal lands. At the time of listing, summer habitat requirements of the Indiana bat were virtually unknown, so listing had minimal impact on protection of summer habitat. Discovery of the first maternity colony under the bark of a dead tree in Indiana was made in 1971 (Cope et al. 1974). Since the advent of transmitters small enough to attach to bats in the late 1980s, summer habitat has been extensively studied and increasingly is the subject of consultation under the ESA.

State endangered species laws also afford protection to the Indiana bat; in most states protection is limited to prohibitions against direct take and does not extend to protection of habitat. The Indiana bat is state listed in 19 of 22 states where it currently occurs including Alabama, Arkansas, Connecticut, Georgia, Illinois, Indiana, Iowa, Kentucky, Ohio, Oklahoma, Maryland, Michigan, Missouri, New Jersey, New York, Pennsylvania, Tennessee, Vermont, and Virginia. The Indiana bat is listed in all states that make up the Midwest RU. State recognition of the need for protection of endangered species, including the Indiana bat, has increased dramatically. When listed under the ESA, the Indiana bat was only listed by two states (Martin 1973). Local laws, particularly ordinances that regulate development in karst areas, also help to protect areas surrounding caves and other karst features from inappropriate development, although local karst protection ordinances are not common within the species' range (Richardson 2003).

Generally, existing regulatory mechanisms are more effective at protecting Indiana bat hibernacula than summer habitat. Hibernacula are discrete and easily identified on the landscape, whereas summer habitat is more diffuse. Even in situations where we know a maternity colony is present, we seldom know the extent of the range of the colony. Further, the conservation value of protecting a hibernaculum is easier to demonstrate and quantify compared with the value of protecting summer habitat. Therefore, application of regulatory mechanisms at hibernacula is more easily justified.

Ownership of Indiana bat habitat is probably the primary factor that limits effectiveness of existing regulatory mechanisms. Of 78 Priority 1 and 2 hibernacula, 16 (21 percent) are federally owned, 19 (24 percent) are state owned, 42 (54 percent) are privately owned, and 1 has ownership recorded as "unknown" (USFWS, unpublished data, 2011). ESA protection extends to hibernacula that are privately owned, but in some cases recovery options may be limited on private lands.

We suspect that the majority of summer habitat also occurs on private land, although this is difficult to document. The location of most Indiana bat maternity colonies is not known, so we cannot assess ownership of summer habitat, as we did for hibernacula. However, in every state within the range of the Indiana bat, the majority of the forest land is privately owned (Smith et al. 2003), particularly in the core maternity range of the species in the Midwest (e.g., percentage of forest land privately owned is 84 percent in Illinois, 83 percent in Indiana, 88 percent in Iowa, 83 percent in Missouri, and 91 percent in Ohio). Krusac and Mighton (2002) and Kurta et al. (2002) noted that opportunities for managing for Indiana bat maternity habitat on public lands are limited and suggested that strategies for engaging private landowners in management are needed.

Factor E. Other Natural or Man-made Factors affecting Its Continued Existence

Natural Factors

Natural catastrophes in hibernacula, particularly flooding and freezing, have the potential to kill large numbers of Indiana bats (USFWS 2007). Anthropogenic factors on the landscape (e.g., siltation in caves as result of agriculture in surrounding area) can cause or exacerbate some of these events. Generally, awareness of the Indiana bat hibernation needs and active management of hibernacula to meet these needs (e.g., removal of debris in caves prone to flooding) have alleviated the threat of these natural catastrophes at most important hibernacula. However, this remains a threat to some localized populations.

Anthropogenic Factors

Environmental Contaminants: With the restrictions on the use of organochlorine pesticides in the 1970s, this significant threat to Indiana bats was reduced. However, cholinesterase inhibiting insecticides, organophosphates, and carbamates have now become the most widely used insecticides (Grue et al. 1997), and the impact of these chemicals on Indiana bats is not known. Because of the unique physiology of bats in relation to reproduction, high energy demands and sophisticated thermoregulatory abilities, much more research needs to be done with these pesticides and their effects on bats. These and other contaminants likely remain a significant and poorly understood threat to Indiana bats. The Draft Revised Indiana Bat Recovery Plan (USFWS 2007) summarizes known and suspected contaminant threats to bats.

Climate Change: The capacity of climate change to result in changes in the range and distribution of wildlife species is recognized, but detailed assessments of how climate change may affect specific species, including Indiana bats, are limited. During winter, only a small proportion of caves provide the right conditions for hibernating Indiana bats because of the species' very specific temperature requirements. Surface temperature is directly related to cave temperature, so climate change will inevitably affect the suitability of hibernacula. Impacts on the availability or timing of emergence of insect prey are also likely. Loeb and Winters (2013) modeled potential changes in Indiana bat summer maternity range within the United States; in their model, the area suitable for summer maternity colonies of Indiana bats was forecasted to decline significantly.

Collisions with Man-made Objects: Collisions of bats with man-made objects have not been fully evaluated, but concern for bat mortality related to such collisions is growing, specifically with reference to collisions with turbines at wind energy facilities. The primary emphasis of wildlife research related to wind energy development has been how these facilities have impacted birds, and to a lesser extent bats, although the focus on bats has increased recently. The results of studies to date indicate that impacts on bat populations may be more severe than the impacts on bird populations (Kuvlesky et al. 2007). Hayes (2013) concluded that "in 2012, over 600,000 bats are likely to have died as a result of interactions with wind turbines." Smallwood (2013) estimated 888,000 bat fatalities per year at 51,630 megawatts (MW) of installed wind-energy capacity in the United States in 2012. (See Smallwood 2013 for a discussion of sources of bias in fatality estimates, including that fatality reports for many

facilities are kept confidential). He further noted that thousands of additional MW of capacity were planned or under construction in 2012, meaning that the annual toll on bats will increase. There is growing concern regarding bat kills given the rapid proliferation of wind energy and the large-scale mortality that has occurred at some facilities, as well as the finding that turbines have been consistently associated with fatalities of some species of bats in many different areas of the continent (Kunz et al. 2007, Arnett et al. 2008).

In addition to wind turbines, much lower rates of bat collision mortalities have been associated with communication towers and other man-made structures (Johnson 2005), including strikes with planes (Peurach et al. 2009). Like collisions with wind turbines, these strikes occur most often during the fall migration. Mortality from collision with a vehicle has also been documented (Russell et al. 2002). While there is no implication to date that Indiana bats are particularly susceptible to such collisions, vehicle traffic may represent a threat to local populations under certain conditions.

ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the ESA, when considering the "effects of the action" on federally listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all Federal, State, or private actions and other activities in the action area (50 CFR 402.02), including Federal actions in the area that have already undergone section 7 consultation, and the impacts of State or private actions that are contemporaneous with the consultation in process. As such, the environmental baseline is "an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including critical habitat), and ecosystem, within the action area" (USFWS and NMFS 1998, page 4-22).

Status of the Indiana Bat in the Action Area

Currently, the Action Area does not support wintering habitat for the Indiana bat. There are no caves or mines suitable for use as hibernacula; the nearest known winter population is a Priority 2 hibernacula located approximately 29 miles away in Greene County, Indiana (USFWS 2007). The area does have sufficient forest cover to be suitable as summer habitat. Land use in the Action Area includes mature woods, open field/scrub habitat, previously disturbed lands, and stream and wetland areas. The mature woods are comprised of sufficient sized trees, scattered snags, and live trees with exfoliating bark that provide suitable roosting, foraging and commuting habitat for Indiana bats. A total of 47.4 acres of suitable habitat is present in the Action Area.

Factors Affecting Indiana Bat Environment within the Action Area

This analysis describes factors affecting the environment of the Indiana bat in the Action Area. (Note that if critical habitat occurred in the Action Area or was affected by the action that would also be described here, but there is no critical habitat to discuss in this case). The baseline includes the past, present and future impacts from federal, state, tribal, local, and private actions

that have occurred or are presently occurring. This section of a biological opinion also incorporates impacts from future federal actions in the Action Area that have undergone section 7 consultation; in this case there are none.

The factors affecting Indiana bats in the Action Area are a subset of the threats affecting the species rangewide and in the Midwest Recovery Unit, as discussed above in the Population Status and Threats section of this document. To characterize the environmental baseline for these bats we must consider the other stressors to these same bats that utilize the Action Area. The main threats to bats within the Action Area are habitat loss and disease (specifically WNS).

Loss and degradation of roosting and foraging habitat

The forest habitat within the Action Area constitutes a significant amount of suitable habitat for Indiana bats in an area under increasing development pressure. Outside of the project's boundaries an unknown amount of forest habitat is being lost and/or degraded by private and public, commercial and residential developments, which are converting, fragmenting, or otherwise degrading forest habitat available for roosting and foraging, especially near urban centers and along primary and heavily traveled secondary roadways and their main intersections.

White-Nose Syndrome

WNS is a devastating disease affecting many eastern U.S. bats including Indiana bats. The disease was first documented in the Midwest RU in 2011 and by the end of the 2013 hibernating season had spread to multiple hibernacula in all states in the RU with the exception of Michigan. In the adjoining Ozark-Central RU, WNS was also confirmed in 2011 and is now confirmed or suspected in all states in the RU, although in fewer sites compared to the Midwest RU. The nearest known hibernaculum to the Action Area is located in the Midwest RU. It is a Priority 2 hibernacula located approximately 29 miles away in Greene County, Indiana (USFWS 2007); WNS was confirmed at this site in 2012. (See http://www.whitenosesyndrome.org/about/where-is-it-now for a current map of where WNS has been found). There has been no WNS surveillance conducted in the Action Area, but given the location it is almost certain that bats from affected hibernacula utilize this area during summer. We do not know how WNS is currently affecting the Indiana bats that are in the Action Area (i.e., we do not know if the populations in maternity colonies and hibernacula to which these bats belong have declined). As noted previously, according to 2015 rangewide population estimates, the Northeast Recovery Unit has lost approximately 70% of its Indiana bats since the onset of WNS. The Appalachian RU, first affected in 2008, had declined 84% and the Midwest RU, affected in 2010, has declined 16 percent. The Ozark-Central RU, where WNS was confirmed in 2011, experienced population declines of less than 1% by 2013. As previously discussed, we expect declines to continue in the coming years as WNS has now been documented in all recovery units.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action, and interrelated and interdependent activities, on the Indiana bat and/or critical habitat. For the proposed project, effects will be analyzed for Indiana bats that roost and forage in the Action

Area. Effects of proposed mitigation, which has been incorporated into the project, will also be assessed. The Action Area and all proposed mitigation sites are within the Midwest Recovery Unit. All effects will be evaluated as they pertain to the Indiana bat population within the Midwest RU and local populations (summering or wintering populations to which impacted bats belong) within that RU.

Note that there is no designated critical habitat for the Indiana bat in or near the Action Area. There is no potential for the project to affect critical habitat.

Analysis of the Effects of the Action

NALC proposes to excavate a limestone quarry that will result in the clearing and permanent loss of 47.4 acres of suitable forest habitat for Indiana bats for summer roosting and foraging.

Cutting an Indiana bat roost tree when bats are present (April 1 – September 30) is likely to result in bats being injured or killed. Therefore, NALC will restrict the removal of trees in the project area to the period between October 1 and March 31 when Indiana bats are not known to be present. Thus, we do not anticipate any direct mortality from the felling of trees in the Action Area. However, some indirect adverse effects could still stress some Indiana bats to the point where take is reasonably certain to occur. For example, the loss of a primary roost tree or multiple alternate roost trees during the non-occupancy season would cause displaced individuals to expend increased levels of energy while seeking out replacement roost trees when they return the following spring. If increased energy expenditure occurs 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 (e.g., WNS). It has been hypothesized that these stresses and delays in reproduction could also result in lower fat reserves being deposited prior to hibernation 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 their delayed development caused them to enter fall migration and winter hibernation periods with inadequate fat reserves.

The loss of bat habitat associated with construction of the NALC limestone quarry project will be permanent. A few bats displaced by clearing for the NALC limestone quarry project may perish, but the majority of displaced bats will likely establish a new summer home range in nearby habitat. The relative abundance and availability of suitable habitat in areas surrounding the project area should greatly enhance the potential for displaced bats to successfully relocate to a new range.

Tree clearing may also result in alteration of foraging habitat and/or travel corridors, forcing bats to fly farther while foraging at night. The quality of foraging habitat may also be temporarily degraded due to erosion, and subsequent sedimentation of stream corridors, associated with construction of the project. Sedimentation could also reduce the overall production of aquatic insects, which make up a portion of the prey base of Indiana bats, which in turn may exacerbate the issue of lost foraging habitat in the area.

To further minimize indirect impacts NALC will conduct phased tree clearing over 15 years, such that all suitable habitat will not be lost in any single year. To compensate for adverse impacts to Indiana bats due to habitat loss, NALC will permanently protect 62.5 acres of suitable forested habitat and restore 16.3 acres of forest area at the established mitigation site within one year of CWA permit issuance, and as approved by the Service.

Indiana Bat Response to the Proposed Action

We estimate that adult female and/or juvenile Indiana bats from one maternity colony may be directly or indirectly taken by the proposed activity. 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 or to the species' regional or range-wide status. At worst, only short-term reproductive loss and reduction in numbers of this local maternity colony 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.

In summary, the following effects are anticipated for the maternity colonies within the Action Area:

- Habitat loss will be minimal.
- Seasonal tree-cutting restrictions will ensure no direct take occurs from the felling/clearing of trees during the active maternity season.
- Phased tree clearing will minimize indirect impacts from habitat loss.
- Protection of 62.5 acres and restoration of 16.3 acres of forest habitat will insure suitable roosting and foraging habitat persists in the Mosquito Creek watershed.

Although there may be some short-term loss and impacts to individuals, these impacts are not likely to affect a colony's long-term reproduction and survival. Thus, all currently extant Indiana bat maternity colonies are likely to persist within the Action Area following implementation of the proposed action.

CUMMULATIVE 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 in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is unaware of any future state, tribal, local or private actions, other than the proposed project, which would impose significant cumulative effects on the Indiana bats that use the area.

Similarly, there is no designated critical habitat for the Indiana bat in or near the Action Area. Thus, cumulative effects to critical habitat, from the proposed action in concert with any future

state, tribal, local or private actions in the Action Area are not anticipated.

CONCLUSION

After reviewing the current status of the Indiana bat, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that construction of the NALC limestone quarry project, as proposed, is not likely to jeopardize the continued existence of the Indiana bat.

Briefly, the basis for this conclusion (as detailed in the biological opinion) is as follows:

- Tree clearing will take place between October 1 and March 31 when bats are not using the area. In addition, tree clearing will be phased over 15 years.
- NALC will restore 16.3 acres and protect, in perpetuity, 62.5 acres of suitable bat habitat in the Mosquito Creek watershed within one year of CWA permit issuance.
- No hibernacula will be impacted by the proposed action.

Critical habitat was designated for the Indiana bat on September 24, 1976 (41 FR 41914). Eleven caves and two mines in six states were listed as critical habitat:
Illinois - Blackball Mine (LaSalle Co.);
Indiana - Big Wyandotte Cave (Crawford Co.), Ray's Cave (Greene Co.);
Kentucky - Bat Cave (Carter Co.), Coach Cave (Edmonson Co.);
Missouri - Cave 021 (Crawford Co.), Caves 009 and 017 (Franklin Co.), Pilot Knob Mine (Iron Co.), Bat Cave (Shannon Co.), Cave 029 (Washington Co.);
Tennessee - White Oak Blowhole Cave (Blount Co.); and
West Virginia - Hellhole Cave (Pendleton Co.).

The proposed action does not affect any of these designated sites and no destruction or adverse modification of that critical habitat is anticipated.

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 U.S. Fish and Wildlife Service (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 the 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 USACE or their designee for the exemption in section 7(o)(2) to apply. The USACE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACE 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 USACE must report the progress of the action and its impact on the species to the Service as specified in the ITS [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The anticipated level of take is being expressed as the permanent loss of 47.4 acres of mature forest that is currently serving as suitable summer roosting and foraging habitat for Indiana bats. It is anticipated that up to 47.4 forested acres (i.e., areas with trees ≥3 inches DBH) will need to be cleared for the construction of the NALC limestone quarry project.

EFFECT OF THE TAKE

In this biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Indiana bat, or destruction or adverse modification of Indiana bat critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following Reasonable and Prudent Measures (RPMs) are necessary and appropriate to further minimize take of Indiana bats:

1. The USACE shall have a Special Condition in the DA permit stating that the project will occur as designed, planned, and documented in the initiation package and this biological opinion, including all avoidance, minimization, and mitigation measures.

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 USACE (and/or NALC staff and their contractors or assigns) must comply with the following terms and conditions, which implement the RPMs. These Terms and Conditions (TCs) are non-discretionary.

1. NALC must agree to implement the proposed action as described in the initiation package.
2. NALC will limit tree clearing activities to occur when bats are not present at the project site, between October 1 and March 31. In addition, tree clearing will be completed in

four phases over 15 years.

3. NALC will permanently protect 62.5 acres of suitable summer habitat at the established mitigation site in the Mosquito Creek watershed.

4. NALC will restore and permanently protect 16.3 acres of forested habitat at the established mitigation site in the Mosquito Creek watershed. The 16.3 acres of trees planted in the reforestation areas shall meet a minimum of 200 living stems per acre, with representation from at least 80% of species planted, at the conclusion of monitoring activities. No single woody species shall constitute more than 20% of the total living stems.

5. The USACE will provide the Service's INFO with a copy of the fully executed conservation easement, which affords permanent protection to the entire 84.3 acre mitigation site.

6. The USACE/NALC will prepare an annual report detailing all Conservation Measures and monitoring efforts 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 INFO by 31 January each year.

   If proposed Conservation Measures or mitigation goals cannot be realized, then USACE/NALC staff will investigate and propose alternative solutions that can be realized and are of equal or greater benefit to Indiana bats within the Action Area.

In conclusion, the Service believes that the permanent loss of currently suitable summer roosting and foraging habitat for Indiana bats will be limited to 47.4 acres of forest habitat in the Action Area. The RPMs, with their implementing TCs, 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 to September 30) such incidental take represents "new information" and will require reinitiation of formal consultation and review of the RPMs provided. The USACE/NALC must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs.

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 (CRs) 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. CRs generally do not focus on a specific project, but rather on an agency's overall program.

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

1. Working with the Service, develop national guidelines for addressing outstanding Indiana bat issues associated with USACE projects within the range of the Indiana bat.
2. Provide funding to conduct research on understanding/controlling and mitigating the effects of White-Nose Syndrome.
3. Expand on scientific research and educational outreach efforts on Indiana bats in coordination with the Service's INFO.
4. In coordination with the INFO, purchase or otherwise protect additional Indiana bat maternity habitat and/or hibernacula/swarming habitat 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 consultation with the USACE on the NALC limestone quarry project for the federally endangered Indiana bat (*Myotis sodalis*). As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is 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.

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