

BIOLOGICAL OPINION
FOR
PUBLIC NOTICE No. CEMVR-OD-P-2006-532
JHL PROPERTIES, LLP

SUMMARY OF FINDINGS

In this Biological Opinion, the US Fish and Wildlife Service (Service) has determined that authorization of the activities described in the subject Public Notice and associated documents will not jeopardize the continued existence of the Indiana bat (*Myotis sodalis*), but will result in incidental take of this species.

By letter dated August 2, 2007, the Service acknowledged the Biological Assessment findings that the project will have no effect on the bald eagle (*Haliaeetus leucocephalus*), Mead's milkweed (*Asclepia meadii*), prairie bush clover (*Lespedeza leptostachya*), and eastern western prairie fringed orchid (*Platanthera leucophaea*) although the more likely orchid species present in the county is the western prairie fringed orchid (*Platanthera praeclara*). The two orchid species occupy similar habitats, neither of which is present at the project site.

The subject Public Notice states that the overall purpose of the project is to construct a lake and associated housing subdivision near Osceola, Iowa. The actions associated with the project involve maternity habitat modification in the summer range of the Indiana bat. The permit applicant has prepared a wetland mitigation plan, and reforestation [afforestation] plan, and proposed deed covenants, which restrict further clearing and promote forest management within the project boundary. This consultation was conducted by an interagency team working with the applicant.

TABLE OF CONTENTS

BACKGROUND	ERROR! BOOKMARK NOT DEFINED.
CONSULTATION HISTORY	ERROR! BOOKMARK NOT DEFINED.
BIOLOGICAL OPINION	6
1.0 Description of the Proposed Action	6
2.1 Status of the Species	8
2.1.1 Species/critical habitat description	8
2.1.2 Life history	8
Diet and Foraging	10
Range	11
2.1.3 Population dynamics	11
2.1.4 Status and distribution	12
Reasons for Decline	12
2.2 Environmental Baseline	14
2.2.1 Status of the Indiana bat within the action area	15
2.2.2 Factors affecting the Indiana bat environment within the action area	15
2.3 Effects of the Action	16
2.3.1.1 Dam spillway and easement construction	17
2.3.1.2 Impoundment	17
Indirect Effects	18
2.3.1.4 Summary	18
2.4 Cumulative Effects	19
2.5 Conclusion	19
2.6.1 Introduction	Error! Bookmark not defined.
2.6.2 Extent of Take Anticipated	20
2.6.3 Effect of the Take	21
2.6.4 Reasonable and Prudent Measures	21
Terms and Conditions	22
CLOSING	23

LITERATURE CITED	24
REINITIATION NOTICE	23

BACKGROUND

This consultation considers the impacts of tree removal in forested habitat utilized by one or more Indiana bat maternity colonies, conversion of land cover surrounding maternity and foraging habitat to a suburban landscape, and the permanent conversion of a formerly forested small watershed to a lake system following authorization of the project under Section 404 of the Clean Water Act.

The Biological Assessment (BA) (USACE 2007) and Biological Opinion (BO) evaluate the effects to listed species, and are intended to clarify any effects that may be insignificant individually, but in totality may be substantial, rise to the level of incidental take, or result in jeopardy or adverse modification of critical habitat. Specifically, the consultation evaluates how authorization of the project will alter current environmental conditions during and following completion of the project and how these anticipated changes in environmental conditions will affect threatened and endangered species occurring within the action area.

This consultation was conducted by an interagency consultation team composed of representatives from the Corps of Engineers Rock Island District, headquartered in Rock Island, Illinois, and the U.S. Fish and Wildlife Service's Rock Island Ecological Services Field Office in Moline, Illinois. Team members cooperated with each other in exchanging information preparing and reviewing the BA and this BO. Ultimate responsibility for the content of the Biological Assessment rests with the Corps, and the ultimate responsibility for the content of this BO rests with the Service.

Oversight of the consultation process was provided by the Service's Field Office Supervisors and the Corps District Office staff.

Species Covered in this Consultation

This consultation covers the Indiana bat (*Myotis sodalis*). During informal consultation, the Interagency Corps-Service Consultation Team concluded that the bald eagle (*Haliaeetus leucocephalus*) Mead's milkweed (*Asclepia meadii*), prairie bush clover (*Lespedeza leptostachya*), and eastern western prairie fringed orchid (*Platanthera leucophaea*) would not be affected by the proposed project and need not be addressed further. For the record, the likely orchid species present in the county is the western prairie fringed orchid (*Platanthera praeclara*). By letter dated August 2, 2007, the Service concurred with the Corps' findings in its Biological Assessment that the project may adversely affect the Indiana bat.

CONSULTATION HISTORY

September 18, 2006 – Site visit with the applicant, Iowa Department of Natural Resources staff and Corps of Engineers staff for a pre-application meeting.

March 2, 2007- Applicant provided application package including mitigation plans to Corps and Service.

March 19, 2007 - Public Notice issued.

April 4, 2007 – Service response to Public Notice. Requested mist net survey for Indiana bat, provided recommendations for forest mitigation, and concurred with wetland mitigation as proposed.

April 26, 2007 - Service provided list of Indiana bat consultants to applicant.

May 15, 2007 – Correspondence from applicant regarding survey.

June 14, 2007 - Telephone call with applicant regarding survey.

June 19, 2007 – Conference and email between Applicant Corps and Service regarding survey.

June 23, 24, 30 and July 1, 2007 – Mist net survey performed.

July 12, 2007 – Corps- Service meeting to discuss schedule. Service provided with consultant's information package including Indiana bat survey results.

July 27, 2007 – Service offices receive Corps' BA and request to initiate formal consultation, dated July 24.

July 31, 2007 – Service acknowledges receipt of the BA and initiation of formal consultation.

August 1, 2007 –Telephone discussion with applicant's consulting firm to discuss BO schedule.

August 2, 2007 – Email response to Corps regarding survey guidelines.

August 2, 2007 – Email response to applicant's consulting firm regarding survey guidelines

BIOLOGICAL OPINION

1. Description of the Proposed Action

The U.S. Army Corps of Engineers (USACE) proposes to permit in-stream and wetland work under Section 404 of the Clean Water Act on an unnamed tributary to Whitebreast Creek in Clarke County, Iowa. This action is described in Public Notice No. CEMVR-OD-P-2006-532, dated March 19, 2007. The applicant for this permit is JHL Properties, LLP. The applicant requires authorization by both USACE and the Iowa Department of Natural Resources to construct a dam for the purpose of lake property development on 651 acres. As described in the Public Notice, the lake will inundate over one mile of stream channel to create an impoundment of 106 acres.

For the purpose of this consultation, the Service considers that the action area includes the entire 651 acre property described in the map set provided with the Public Notice. This includes the section of Whitebreast Creek traversing the property, the tributary and associated forested, grassland, and wetland cover types within the property boundary.

This consultation focuses on the actions resulting from authorizing dam construction, work in wetlands, inundation of a small watershed, and subsequent conversion of an undeveloped mix of rural habitat types to a suburban or exurban housing development.

1.1 Conservation Measures

Conservation measures to minimize harm to listed species which are proposed by the action agency are considered part of the proposed action and their implementation is required under the terms of the consultation. The Corps included the following conservation measures by reference including reducing the acreage of additional clearing and incorporation of an afforestation plan, in its July 2007 Biological Assessment:

Several planned bat habitat conservation efforts have been designed by JHL Properties, LLP to reduce adverse affects identified by Benedict to Indiana Bat and its habitat. These conservation efforts include: reducing habitat disturbance/destruction in the dam spill way area, reducing habitat disturbance/destruction in 16 residential lakeside lots, developing and implementing an afforestation plan for the site, and incorporating covenants that address tree removal and re-planting.

JHL Properties, LLP is reducing adverse affects to Indiana Bat and its habitat by minimizing the amount of bat habitat removal required for the emergency spillway and utility easements. There is 3.96 acres of Indiana Bat habitat in the emergency spillway; 1.54 acres of trees will not be removed (these trees are nearest to Whitebreast Creek). 2.42 acres of upland and lowland trees maximum will be removed. The average diameter at breast height of Shagbark Hickory trees to be removed from this area is 8.1 inch dbh. Utility easements will require a maximum 0.47 acres of lowland trees be removed; these trees are part of the 2.42 total be removed. This utility easement is located along an existing clearing used for vehicle access; using the access trail minimizes habitat impacts while still providing practical widths for installation, operation, and maintenance.

JHL Properties, LLP is reducing adverse affects to Indiana Bat and its habitat by setting aside and protecting 88% of the affected acres identified for residential lots. A maximum 5,000 square foot construction footprint has been added to the 16 lakeside lots that have Indiana Bat habitat as described in Mr. Benedict's Report. The footprint allows for a residential structure as well as a construction zone. The carefully placed footprints retain minimum lot setbacks and preserve 6.80 acres out of 7.74 total acres (88%) of Indiana Bat habitat. These 16 lots have a total acreage of 11.26 acres – the remaining acreage is not in trees.

The BA further incorporated the following deed covenant language as Conservation Measures:

1. No removal of deciduous trees 2 inches in diameter or larger, measured at 16 inches above ground level, shall be performed without authorization from the jurisdiction.
 1. a. Removal of deciduous trees 2 inches in diameter or larger, but less than 8 inches in diameter may be authorized on platted development lots by the jurisdiction for construction and safety purposes.
 1. b. Removal of deciduous trees 2 inches in diameter or larger, but less than 8 inches in diameter may be authorized on jurisdiction properties, utility easements, and street right of ways for maintenance and safety reasons.
 1. c. Trees that have fallen due to natural causes.
2. Within Arbor Valley Development all potential Indiana Bat habitat trees are protected and will not be removed except as described in [Covenant No. 2.a.iii].
3. Potential Indiana Bat Habitat may be removed with jurisdictional approval under the following conditions:
 - 3.a. Dead trees shall be removed from street right of ways and developed residential lots between October 1 and March 30 of each year.
 - 3.b. Trees that have fallen due to natural causes.
 - 3.c. Lots 20, 23, and 24 of Vintner's Cove Subdivision (Phase I of the Arbor Valley Development) may contain potential Indiana Bat habitat timber to the extent the timber would prohibit the development as residential lots. If potential Indiana Bat habitat timber is present on the designated lots at the time of development no more than 5000 square feet of timber containing potential Indiana Bat habitat will be removed from each of the designated lots: Potential Indiana Bat habitat timber to be removed under this paragraph will only occur during the annual period beginning October 1 and ending March 30.
 - 3.d. In future development phases of Arbor Valley Lake Development approximately 13 lots appear to have potential Indiana Bat habitat timber to the

extent the timber would prohibit development as residential lots. For future lake shore lot development will not be restricted by potential Indiana Bat habitat timber. Any future lake shore lot owner will be authorized to remove no more than 5000 square feet of potential Indiana Bat habitat timber if a 5000 square foot area for building is not available on site excluding timber, set backs, and easements. Potential Indiana Bat habitat timber to be removed under this paragraph will only occur during the annual period beginning October 1 and ending March 30.

4. Afforestation at twice the removal rate is required as a condition of the jurisdictions authorization for tree removal as per Covenant No. 2.a.i.1.

4.a. Replacement trees shall be a minimum of $\frac{3}{4}$ inch in diameter and the same specie as removed.

4.b. Replacement trees shall only be planted during the fall or spring of the year (optimum planting seasons).

4.c. Replacement trees shall be planted on the same lot where removal occurred or on one of the afforestation areas set aside for residential building tree replacement.

2. Status of the Species

This section presents the biological or ecological information relevant to formulating the biological opinion. Appropriate information on the species' life history, its habitat and distribution, and other data on factors necessary to its survival are included to provide background for analysis in later sections. This analysis documents the effects of past human and natural activities or events that have led to the current range-wide status of the species. Portions of this information are also presented in listing documents, the recovery plan (USFWS 1983) and the draft revised recovery plan (USFWS 1999), and are referenced accordingly.

2.1 Species/Critical Habitat Description

The Indiana bat (*Myotis sodalis*) 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]). Eleven caves and two mines in six states were listed as critical habitat on September 24, 1976 (41 FR 41914). These sites along with other known hibernacula were classified in the Indiana Bat Recovery Plan as Priority One, containing at least 30,000 bats; Priority Two, containing 1000 to fewer than 30,000; and Priority Three with less than 1,000 bats (USFWS 1983). In the 1999 draft revised Recovery Plan, the Priority Two lower limit was reduced to 500 bats. In summary, the objectives of the Recovery Plan are to: (1) protect hibernacula; (2) maintain, protect, and restore summer maternity habitat; and (3) monitor population trends through winter censuses.

2.2 Life History

The Indiana bat is a medium-sized bat with a head and body length that ranges from 41 to 49 mm. The fur is described as dull pinkish-brown on the back, and somewhat lighter on the chest and belly. The ears and wing membranes do not contrast with the fur (Barbour and Davis 1969). There are no recognized subspecies. Generally, Indiana bats hibernate from October through April (Hall 1962, LaVal and LaVal 1980), depending upon local weather conditions. Figure 1 provides a depiction of the annual cycle). They hibernate in large, dense clusters, ranging from 300 bats per square foot to 484 bats per square foot (Clawson et al. 1980, Clawson, pers. observ. October 1996 in USFWS 2000). Upon arrival at hibernating caves in August-September, Indiana bats "swarm," a behavior in which large numbers of bats fly in and out of cave entrances from dusk to dawn, with relatively few roosting in the caves during the day (Cope and Humphrey 1977). Swarming continues for several weeks and mating occurs during the latter part of the period. Fat supplies are replenished as the bats forage prior to hibernation.

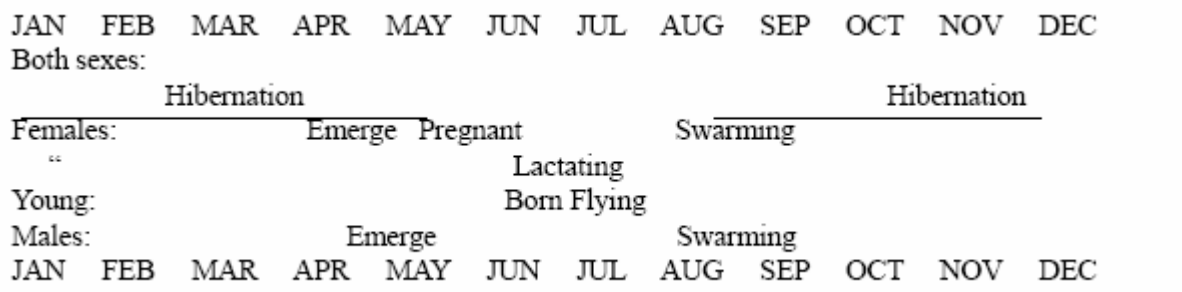


Figure 1. Indiana Bat Annual Chronology

Indiana bats tend to hibernate in the same cave at which they swarm (LaVal et al. 1976), although swarming has occurred at caves other than those in which the bats hibernated (Cope and Humphrey 1977). During swarming, males remain active over a longer period of time at cave entrances than do females (LaVal and LaVal 1980), probably to mate with the females as they arrive. After mating, females enter directly into hibernation. A majority of bats of both sexes hibernate by the end of November (by mid-October in northern areas (Kurta, pers. observ. June 1997), but hibernacula populations may increase throughout the fall and even into early January (Clawson et al. 1980).

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, whereas males may not mature until the second year. Limited mating activity occurs throughout the winter and in late April as the bats leave hibernation (Hall 1962).

Females emerge from hibernation ahead of males; most winter populations leave by early May. Some males spend the summer near hibernacula in Missouri (LaVal and LaVal 1980) and West Virginia (Stihler, pers. observ. October 1996, in USFWS 2000). In spring when fat reserves and food supplies are low, migration is probably hazardous (Tuttle and Stevenson 1977). Consequently, mortality may be higher in the early spring, immediately following emergence.

Females may arrive in their summer habitats as early as April 15 in Illinois (Gardner et al. 1991a, Brack 1979). During this early spring period, a number of roosts (e.g., small cavities) may be used temporarily, until a roost with larger numbers of bats is established. Humphrey et al. (1977)

reported that Indiana bats first arrived at their maternity roost in early May in Indiana, with substantial numbers arriving in mid-May. Parturition occurs in late June and early July (Easterla and Watkins 1969, Humphrey et al. 1977) and the young are able to fly between mid-July and early August (Mumford and Cope 1958, Cope et al. 1974, Humphrey et al. 1977, Clark et al. 1987, Gardner et al. 1991a, Kurta et al. 1996).

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. Females typically utilize larger foraging ranges than males (Garner and Gardner 1992). Prior to the survey conducted for this project, maternal activity had been recorded at 26 locations in Iowa, and approximately 246 locations range-wide, (Andrew King, USFWS, pers. com. 2007), based on the capture of reproductive females (pregnant or lactating). Currently, the top five States by total records are Indiana (83), New York (32), Kentucky (32) Illinois (28), and Iowa (26).

Trees in excess of 16 inch dbh with exfoliating bark are considered optimal for maternity colony roost sites, but trees in excess of 9 inch dbh appear to provide suitable maternity roosting habitat (Romme et al. 1995). Cavities and crevices in trees may also be used for roosting. In Illinois, Gardner et al. (1991) found that forested stream corridors and impounded bodies of water were preferred foraging habitats for pregnant and lactating Indiana bats.

After the summer maternity period, Indiana bats migrate back to traditional winter hibernacula. Some male bats may begin to arrive at hibernacula as early as July. Females typically arrive later and by September the number of males and females are almost equal. Autumn “swarming” occurs prior to hibernation. During swarming, bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in the caves during the day. 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.

Male Indiana bats may be found throughout the entire range of the species. Males appear to roost singly or in small groups, except during brief summer visits to hibernacula. Males have been observed roosting in trees as small as 3 inch diameter at breast height (dbh).

2.3 Diet and Foraging

Indiana bats forage over a variety of habitat types but prefer to forage in and around the tree canopy of both upland and bottomland forest or along the corridors of small streams. Bats forage at a height of approximately 2-30 meters under riparian and floodplain trees (Humphrey et al. 1977). They forage between dusk and dawn and feed exclusively on flying insects, primarily moths, beetles, and aquatic insects. Females in Illinois were found to forage most frequently in areas with canopy cover of greater than 80% (Garner and Gardner 1992). The species feeds on flying insects, both aquatic and terrestrial. Diet appears to vary across the range, as well as seasonally and with age, sex and reproductive status (Murray and Kurta 2002, Lee 1993, Belwood 1979). Murray and Kurta (2002) found that diet is somewhat flexible across the range and that prey consumed is potentially affected by regional and local differences in bat assemblages and/or availability of foraging habitats and prey. For example, Lee (1993) and Murray and Kurta (2002) found that adult aquatic insects (Trichoptera and Diptera) made up 25-81% of Indiana bat diets in northern Indiana and Michigan. However, in the southern part of the species range terrestrial insects (Lepidoptera) were the most abundant prey items (as high as

85%) (Lee 1993, Brack and LeVal 1985, LaVal and Laval 1980, Belwood 1979). Kiser and Elliot (1996) found that Lepidopterans (moths), Coleopterans (beetles), Dipterans (true flies) and Homopterans (leafhoppers) accounted for the majority of prey items (87.9% and 93.5% combined for 1994 and 1995, respectively) consumed by male Indiana bats in their study in Kentucky. Diptera, Trichoptera, Lepidoptera, and Coleopterans also comprised the main prey of Indiana bats in Michigan (Murray and Kurta 2002); however, Hymenopterans (alate ants) were also taken when abundant.

Reproductively active females and juveniles exhibit greater dietary diversity than males and non-reproductively active adult females. Lee (1993) found that reproductively active females eat more aquatic insects than adult males or juveniles in Indiana. These differences in dietary demands between age groups, sex and reproductive stage is perhaps due to higher energy demands of reproductive females and juveniles. Male Indiana bats summering in or near hibernation caves feed preferentially on moths and beetles.

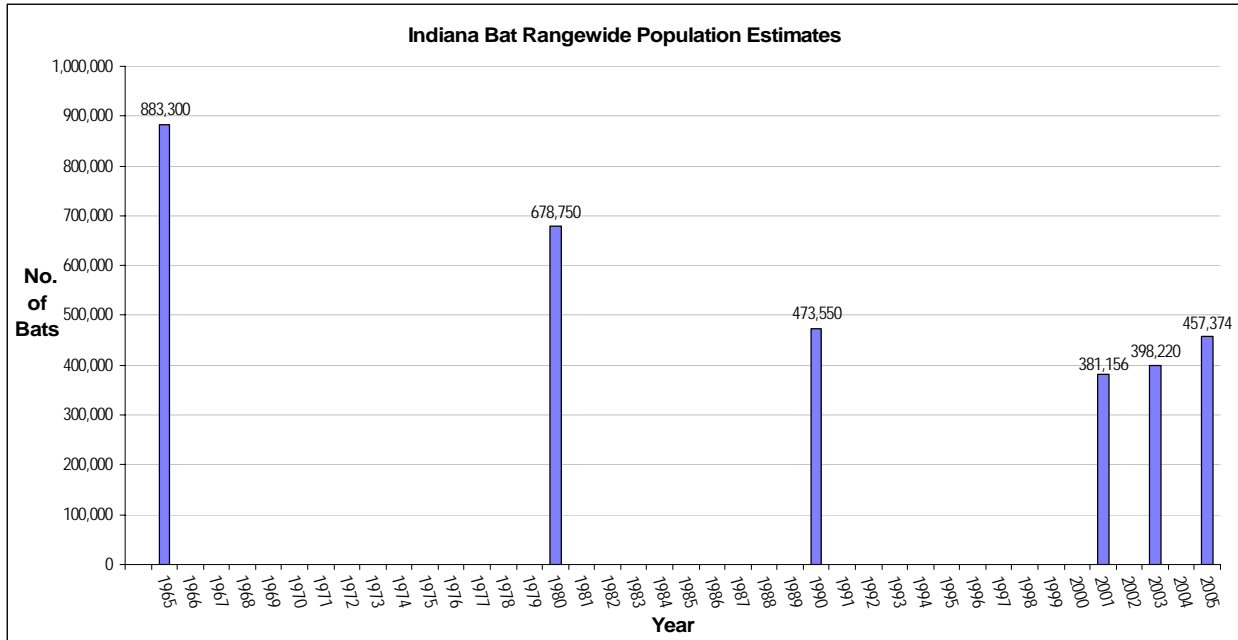
2.4 Range

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. More than 85% of the entire known population of Indiana bats hibernates in only nine caves.

2.5 Population Dynamics

Based on censuses taken at all hibernacula, the total known Indiana bat population is estimated to number about 457,000 bats (Figure 1). This represents an increase over the 2003 rangewide estimate of 398,000, but regional trend disparities noted by Clawson (2002) still exist between northern and southern populations. The most severe declines in wintering populations have occurred in two states: Kentucky, where 200,200 bats were lost between 1960 and 2001, and Missouri, where 326,000 Indiana bats were estimated to be lost in the same period. In Indiana, populations dropped by 50,000 between the earliest censuses and 1980, but have returned to former levels in recent years. Currently, almost half of all the hibernating Indiana bats in existence (approximately 173,100) winter in Indiana.

Figure 1. 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 bat populations first were first surveyed in the late 1950s (Hall 1962). In the decades since then, the total rangewide population of Indiana bats declined 57% (Clawson 2002). Regional trends contrast sharply, with the southern states losing approximately 80% over the survey period, and the northern states gaining 30% (Clawson 2002).

2.6 Status and Distribution

The current status and distribution of the species is described above. The reasons for listing the species were summarized in the original Recovery Plan as (1) Hibernating populations in Missouri have shown a decline over the last seven years despite an intensive cave management program; (2) The largest known hibernating population at Pilot Knob Mine, Missouri, continues to be threatened by subsidence (mine collapse); (3) Kentucky hibernating populations are not protected adequately and continue to be depressed (USFWS 1983). Clawson (2002) provided that the hibernating populations in Missouri have continued to decline, Pilot Knob Mine has undergone continued subsidence to the point at which it is unsafe to enter for survey, and Kentucky hibernating populations have also continued to decline. The species' range-wide trend is described in 2.5 Population dynamics, preceding.

2.7 Reasons for Decline

Not all of the causes of Indiana bat population declines have been determined. Although several known human-related factors have caused declines in the past, they may not solely be responsible for recent declines.

Documented causes of Indiana bat population decline include:

Disturbance and vandalism. A serious cause of Indiana bat decline has been human disturbance

of hibernating bats during the decades of the 1960s through the 1980s. Bats enter hibernation with only enough fat reserves to last until spring. When a bat is aroused, as much as 68 days of fat supply is used in a single disturbance (Thomas et al. 1990). Human use (e.g., including recreational cavers and researchers) near hibernating Indiana bats can cause arousal (Humphrey 1978, Thomas 1995, Johnson et al. 1998). If this happens too often, the bats' fat reserves may be exhausted before the species is able to forage in the spring.

Active programs by State and Federal agencies have led to the acquisition and protection of a number of Indiana bat hibernacula. Of 127 caves/mines with populations >100 bats, 54 (43%) are in public ownership or control, and most of the 46 (36%) that are gated or fenced are on public land. Although such conservation efforts have been successful in protecting Indiana bats from human disturbance, they have not been sufficient to reverse the downward trend in many populations.

Improper cave gates and structures. Some hibernacula have been rendered unavailable to Indiana bats by the erection of solid gates in the entrances (Humphrey 1978). Since the 1950's, the exclusion of Indiana bats from caves and changes in air flow are the major cause of loss in Kentucky (an estimated 200,000 bats at three caves) (USFWS 1999). Other cave gates have so modified the climate of hibernacula that Indiana bats were unable to survive the winter because changes in air flow elevated temperatures which caused an increase in metabolic rate and a premature exhaustion of fat reserves (Richter et al. 1993).

Natural hazards. Indiana bats are subject to a number of natural hazards. River flooding in Bat Cave, Mammoth Cave National Park, drowned large numbers of Indiana bats (Hall 1962). Other cases of hibernacula being flooded have been recorded by Hall (1962), DeBlase et al. (1965), and USFWS (1999). A case of internal cave flooding occurred when tree slash and debris (produced by forest clearing to convert the land to pasture) were bulldozed into a sinkhole, blocking the cave's rain water outlet and drowning an estimated 150 Indiana bats (USFWS 1999).

Another hazard exists because Indiana bats hibernate in cool portions of caves that tend to be near entrances, or where cold air is trapped. Some bats may freeze to death during severe winters (Humphrey 1978, Richter et al. 1993). Indiana bats are vulnerable to the effects of severe weather when roosting under exfoliating bark during summer. For example, a maternity colony was displaced when strong winds and hail produced by a thunderstorm

stripped the bark from their cottonwood roost and the bats were forced to move to another roost (USFWS 1999).

Suspected causes of Indiana bat decline include:

Microclimate effects. Changes in the microclimates of caves and mines may have contributed more to the decline in population levels of the Indiana bat than previously estimated (Tuttle, in lit. August 4, 1998). Entrances and internal passages essential to air flow may become larger, smaller, or close altogether, with concomitant increases or decreases in air flow. Blockage of entry points, even those too small to be recognized can be extremely important in hibernacula that require chimney-effect air flow to function. As suggested by Richter et al. (1993) and Tuttle (in lit. August 4, 1998), changes in air flow can elevate temperatures which can cause an increase in metabolic rate and a premature exhaustion of fat reserves.

Hibernacula in the southern portions of the Indiana bat's range may be either near the warm edge of the bat's hibernating tolerance or have relatively less stable temperatures. Hibernacula in the North may have passages that become too cold. In the former case, bats may be forced to roost near entrances or floors to find low enough temperatures, thus increasing their vulnerability to freezing or predation. In the North, bats must be able to escape particularly cold temperatures. In both cases, modifications that obstruct air flow or bat movement could adversely impact the species (USFWS 1999).

Land use practices. The Indiana bats' maternity range has changed dramatically since pre-settlement times (Schroeder 1991; Giessman et al. 1986; MacCleery 1992; Nigh et al. 1992). Most of the forest in the upper Midwest has been fragmented, fire has been suppressed, and native prairies have been converted to agricultural crops or to pasture and hay meadows for livestock. Native plant species have been replaced with exotics in large portions of the maternity range, and plant communities have become less diverse than occurred prior to settlement. Additionally, numerous chemicals are applied to these intensely cropped areas. The changes in the landscape and the use of chemicals (McFarland 1998) may have reduced the availability and abundance of the bats' insect forage base.

In the eastern U. S., the area of land covered by forest has been increasing in recent years (MacCleery 1992; Iverson 1994; Crocker et al. 2006). Whether or not this is beneficial to the Indiana bat is unknown. The age, composition, and size class distribution of the woodlands will have a bearing on their suitability as roosting and foraging habitat for the species outside the winter hibernation season.

Chemical contamination. Pesticides have been implicated in the declines of a number of insectivorous bats in North America (Mohr 1972, Reidinger 1972, Reidinger 1976, Clark and Prouty 1976, Clark et al. 1978, Geluso et al. 1976, Clark 1981). The effects of pesticides on Indiana bats have yet to be studied. McFarland (1998) studied two sympatric species, the little brown bat (*Myotis lucifugus*) and the northern long-eared bat (*M. septentrionalis keenii*) as surrogates in northern Missouri and documented depressed levels of acetylcholinesterase, suggesting that bats there may be exposed to sublethal levels of organophosphate and/or carbamate insecticides applied to agricultural crops. McFarland (1998) also demonstrated that bats in northern Missouri are exposed to significant amounts of agricultural chemicals, especially those applied to corn. BHE Environmental, Inc. (1999) collected tissue and guano samples from five species of bats at Fort Leonard Wood, Missouri and documented the exposure of bats to p,p'-DDE, heptachlor epoxide, and dieldrin.

3. Environmental Baseline

The purpose of the environmental baseline is to describe the current status of the species within the action area and those factors that have contributed to this state. Range-wide factors affecting the species include those listed previously under Reasons for Decline. Other factors with the potential to adversely affect roosting habitat include forest clearing by private industry within the summer range in Iowa, woodlot management and wetland drainage by landowners, and land management activities by the State of Iowa.

Much of the remaining forested land cover classes in the predominately agricultural areas of

southeastern Iowa represent potential summer habitat for the Indiana bat. Due to their migratory behavior, Indiana bats likely follow watershed drainage corridors en route to their summer habitats and in returning to their hibernacula. In doing so, they may stop and roost temporarily in suitable floodplain trees, manmade structures such as barns or bridges, or may select an area to spend the summer in a maternity colony. Little definitive information exists regarding the species' maternity habitat selection versus habitat availability.

3.1 Status of the Indiana Bat within the Action Area

The action area includes the entire 651 acres associated with the development. As described in the Biological Assessment, the action area is currently composed of approximately 65 percent hay fields, 20 percent forest, and 15 percent waterway/streambank and associated lowland drainage areas (10 percent) and grasslands (5 percent). In early 2005 approximately 51 acres or 43 percent of the original forested cover within the action area was cleared within the lake inundation zone, primarily along the drainageways to and along the unnamed tributary. Review of aerial photographs indicates that this forest cover was contiguous and connected those remaining forest patches in the action area. A mist net survey in 2007 resulted in the capture of six bat species, including lactating female Indiana bats and suggests that forest patches in the northwest portion of the action area provide foraging habitat for members of a maternity colony. In addition, because lactating females of 6 species, including the sympatric northern long-eared bat (*Myotis septentrionalis*) were captured in the action area, it is possible that suitable maternal roost trees are present in the action area for the Indiana bat. In the absence of specific spatial data, it is not known if maternity roost trees were among those previously removed. It is likely that removal of 43 percent of the forested land cover fragmented foraging habitat and appreciably altered habitat characteristics that supported at least one Indiana bat maternity colony. The effects of this action on the colony would be the potential reduction in habitat features contributing to reproductive success and recruitment. The wintering location of bats using the action area is not known. The action area is over 100 miles away from Priority 4 hibernaculae in Missouri and Illinois, and banding records indicate that bats captured farther north in Marion County had migrated approximately 287 miles from a Priority 1 hibernaculum in Iron County, Missouri (Clark et al. 1987). Presumably long distance migration and pregnancy following a 6 to 7 month hibernation period exacts an energetic toll; therefore any additional energy demands from searching for new roost trees would be expected to result in slower prenatal development or abortion, delayed parturition, slower postnatal development, delayed weaning and volancy, and increased juvenile predation risk. These effects would all contribute to decreased recruitment of Indiana bats, a species of known low fecundity, if a supply of alternative roost trees were not available on or near the action area.

3.2 Factors Affecting the Indiana Bat Environment within the Action Area

Disturbance and vandalism, improper gates at hibernaculae, natural hazards, microclimate changes, land use in the maternity range, and contaminants were discussed in status of the species, preceding. The long-term maintenance of suitable summer habitat on private land is questionable throughout the agricultural Midwest, as commodity markets drive conversion of land cover types from forest to cropland, and under some conditions as noted by Crocker et al. (2006), back to forest. Elsewhere, urbanization of agricultural lands results in the conversion of rural landscapes consisting of mixed forest, shrub-scrub, grassland, crop, and stream cover types to suburban landscapes consisting of lawn grass, domestic plantings, homes, paving, and

associated infrastructure. Survey efforts are infrequent, and despite the apparent abundance of seemingly suitable habitat in the upper Midwest, definitive evidence of habitat occupation is limited to studies previously noted. It is difficult to determine the importance of the action area to recovery of the species in the absence of additional research, but given the life history information preceding, and the capture of lactating females in remaining forested portions of the action area, it is likely that those portions of the action area are suitable maternity habitat and supported at least one summer colony of Indiana bats. Although forest clearing occurred during winter months, destruction of multiple roost trees in a small area can greatly increase the thermoregulatory costs for individuals returning to familiar sites and could potentially disrupt the social bonds of a colony (Kurta and Murray 2002). It is not known if primary or alternate maternity roost trees were removed in this area. Given the maternity site fidelity noted in Life History preceding, female Indiana bats returning to the action area in the spring of 2005 would have been dispersed to alternative roost trees on or near the action area. Because maternal Indiana bats were captured in two of the remaining forest patches 2 years following the clearing event, it is likely that the fragmentation and loss of 43 percent of the forest cover resulted in substantial loss of reproductive potential for the colony using the action area, negatively affecting its long-term viability. Because this is a long-lived and highly philopatric species, individuals would be expected to attempt to maintain colony cohesion as close to familiar maternal habitat as possible. Therefore, protection and enhancement of the remaining habitat would be expected to contribute to colony cohesion and successful recruitment for the species.

4. Effects of the Action

This section includes an analysis of the direct and indirect effects of the proposed action on the species and/or its critical habitat and its interrelated and interdependent activities.

The developer proposes to clear an additional 2.4 acres of forested habitat in proximity to the capture locations of lactating female Indiana bats, and allow another total acre of tree removal associated with home siting on 13 individual lots. The formerly forested small watershed will be inundated to create 106 surface acres of open water. Surrounding portions of non-forested land cover will shift to domestic lawn and garden plantings. Paving for the housing development will further reduce terrestrial habitat. The effect of these actions will be potential loss of existing unidentified roost trees, modification of roost and associated foraging area characteristics, such as canopy density, solar exposure, and foraging cover. The likely behavioral response of bats using the action area will be to disperse to adjacent suitable habitat. Because five other species of bats were captured on the action area, the potential for increased interspecific competition following inundation of 106 out of 651 acres of terrestrial habitat exists. Resource partitioning among foraging bats, including *Myotis sodalis* suggests such competition (LaVal et al. 1977), (Lee 1993), (Butchkoski and Turner 2005). The permanent conversion of former habitat to a lake will eliminate the long term opportunities for regaining foraging habitat, forest succession, and development of new roost sites on the tributary corridor. As described in the environmental baseline, the value of the action area is substantially reduced and the long term viability of the colony may be at risk. The additional increment of habitat modification will have no noticeable effect on the trajectory of the colony established by the baseline.

Conservation measures to minimize harm to listed species which are proposed by the action agency are also considered part of the proposed project and their implementation is required under the terms of the consultation. Implementation of the proposed mitigation plan via

afforestation of other habitats, and the enforcement of deed covenants to specifically protect existing habitats and improve forest cover will partially offset a portion of habitat loss and may help colony members bridge short term effects of habitat conversion to reestablish their colony elsewhere.

4.1 Dam Spillway and Easement Construction

As described by the applicant, additional clearing for this feature will be limited to approximately 2.4 acres. This work will occur within the largest remaining forest patch where maternal bats were captured, but will be scheduled during the fall-winter period when bats are not present. As the specific location of the maternal roost area was not pursued, there is no guarantee that a primary or secondary roost tree will not be removed during the hibernation period, thereby altering the character of a maternity roost area. As noted previously, the effects from removal of roost trees include increased energetic demands, exposure to inter and intra-specific competition, and exposure to predation while searching unfamiliar habitat for new roosting and foraging areas. Loss of familiar roost trees, while adverse in the short term, would not be expected to have long term consequences for the colony utilizing habitat remaining on the action area because such clearing will be limited to a fraction of the remaining forest cover.

4.2 Impoundment

As estimated by the applicant, approximately 51 acres of trees were cleared from the area below the estimated 106 acre lake surface elevation. Based on the foraging behavior noted in section 2.1.2 Life History, it is likely that the area to be impounded provided suitable foraging habitat, if not maternity roost habitat prior to clearing. Inundating this area in perpetuity will prevent regeneration of forest and succession of that forest to suitable habitat for Indiana bats. It is also likely that the cleared watershed contributed to the insect forage base in the action area.

The proposed conservation measures, however, are anticipated to minimize the level of impact such that neither reproductive success nor survival will be further reduced or appreciably affected. First, the proposed conservation measures include restricting activities to periods when bats are not likely to be using the area. This will reduce nearly all direct exposure to mortality from project impacts. Second, the proposed conservation measures also include maintaining the character of remaining forest patches in terms of Indiana bat habitat suitability. Thus, we expect that despite the alterations of habitat that will occur in conjunction with housing development, the suitability of the larger forest patches will not be noticeably reduced from that which has already occurred.

4.3 Interrelated and Interdependent Actions

Interrelated and interdependent actions associated with the proposed action include housing development and urbanization of a rural area. Subdivision and lake development actions with the potential to affect Indiana bats are described in the BA. Effects would be realized as injury or death to adults and young bats from roost tree toppling by individual landowners, tree removal for human safety and utility line rights-of-way, and energetic stress from increased foraging and searching for new suitable foraging areas, roost areas, and roost trees by pregnant females returning to the action area after their traditional summer areas are cleared. Paving will reduce total landcover and conversion of hay and grassland to domestic landscaping will also modify the

action area. While it is possible to avoid most direct impacts to potential roost trees, roosting areas, and maternal colonies by scheduling construction/clearing during the non-hibernation season, it is unlikely that all impacts will be avoided over the 50 year project period.

4.4 Indirect Effects

Indirect effects may include other Federal activities that have not undergone Section 7 consultation and non-Federal actions that might reasonably be expected to occur in the future as a result of the subject action. In this consultation the Service considered the potential for such future activities on the action area and determined that, while the applicant has identified a project package that essentially makes other additional Federal or non-Federal activities in the action area unlikely, actions by individual landowners remain likely.

We expect that landowners may cut occupied trees during the active season. In addition, tree clearing and general silvicultural practices as part of forest management or landscaping scheduled during the hibernation period can still result in removal of roost trees, rendering them unavailable to pregnant bats demonstrating roosting area and/or roost tree fidelity following migration in the spring. Although loss of a primary roost tree or entire roosting area can cause adverse effects on Indiana bats, we anticipate that very few instances will arise where adverse effects will be unavoidable. In those instances where adverse effects are unavoidable, decreases in the long-term reproductive success and viability of the colony are unlikely. We feel this is unlikely because any colony-level effects have already occurred from prior habitat modification, and the conservation measures proposed by the action agency will minimize further adverse effects to individuals, thereby avoiding long-term colony-level impacts. Thus, if the existing colony is still viable, the conservation measures will ensure that the additional habitat modification proposed will not cause negative reproductive or viability consequences. Specifically the conservation measures will prevent tree removal during the active season; require 2 to 1 replacement of any trees removed on residential lots; and planting of an aggregate 29.75 acres in 3 areas, two of which are adjacent to stream and wetland habitat and are expected to restore foraging habitat over the long term.

5. Summary

The substantial effects associated with this project occurred prior to consultation and are not evaluated here. As explained previously, the remaining aspects of the project involve an additional small increment of habitat modification. Therefore this analysis focused on the effects of the additional increment of habitat modification. Potential impacts of project authorization on Indiana bats involve the increment of effects resulting from displacement from any remaining summer roost trees on remaining forest patches on the north east portions of the action area. Tree removal activities include: clearing an additional 2.4 acres in construction zones, removing an undetermined number of suitable trees for street right of ways and removal of single trees presenting human hazards during landscaping activities by private landowners during lot development.

These effects could include adult mortality from infrequent tree toppling, harm and harassment from increased energy demands from searching for and establishing new territories, increased inter and intraspecific competition, and/or increased exposure to predation. Implementation of the proposed conservation measures will minimize the potential localized adverse effects of

individual project actions on Indiana bats.

No direct effects on hibernacula, or designated critical habitat are foreseen from implementation of the recommended plan.

6. Cumulative Effects

Cumulative effects include the effects of State, local or private actions that may occur in the action area. 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 ESA. No additional activities in the action area beyond those previously described are anticipated.

The Service is unaware of any other non-Federal actions that are reasonably certain to occur which may affect the Indiana bat in the action area. However similar actions to those described will require authorization under Section 404 of the Clean Water Act. Given appropriate environmental coordination in the Section 404 review process, impacts to the

Indiana bat can be avoided. Therefore, any cumulative effects due to non-Federal actions are considered to be negligible.

7. 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 the proposed action is not likely to jeopardize the continued existence of the Indiana bat, and is not likely to destroy or adversely modify designated critical habitat.

The proposed project is not expected to affect hibernating activities or habitat. Authorization of the proposed project, however, presents the potential to affect summer habitat for both female and male Indiana bats. Although infrequent and likely to be minimized by the conservation measures proposed, it is likely that adverse impacts to the individuals of the species cannot be avoided entirely, and take will occur. Potential impacts to Indiana bat habitat include removal of occupied roost trees and loss of foraging habitat. Based on the preceding estimates of the small percentage of total forested habitat affected, and conservation measures proposed by the action agency, it is expected that adverse impact to Indiana bats will be minimized but, due to the unknown distribution of roosting bats on the action area, not avoided entirely. Because site specific adverse impacts to Indiana bats are likely in only a few instances, we believe authorization of the proposed project will not appreciably reduce reproduction, numbers, or distribution of Indiana bats within its range or appreciably reduce the likelihood of recovery of the species. The action area is geographically distant from designated critical habitat, thus authorization of the proposed project does not affect critical habitat and no destruction or adverse modification of that critical habitat is expected.

8. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA, prohibits the take of endangered and threatened species without special exemption. Take is defined as to

harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or 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 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 behavioral 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 Corps so that they become binding conditions of any grant or permit issued to the Applicant, JHL Properties, LLP, for the exemption of Section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Corps (1) fails to assume and implement the terms and conditions, or (2) fails to require the Applicant to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement, pursuant to 50 CFR § 402.14(i)(3).

8.1 Extent of Take Anticipated

Incidental take of Indiana bats is expected to be in the form of injury, death, harm and harassment. Based on the actions as described and the conservation measures proposed by the Corps, we do not anticipate any direct take of Indiana bat maternity colonies to occur and that incidental take relative to maternal bats will occur in the form of harm and harassment from habitat loss as the proposed action will alter habitat characteristics over 651 acres within suitable maternity habitat. Furthermore, as the applicant is committed to maintaining the suitability of remaining forest habitat and potentially occupied sites, we do not anticipate that indirect take resulting from habitat alterations during the inactive season will result in loss of individuals. However, the project will entail actions undertaken by individual landowners during landscaping activities, and in spite of proposed covenants, incidental take of a few individuals over the initial period following authorization is likely.

Due to the phased nature of the project and the conditions that drive housing markets, we are unable to determine where and when this take will occur. Furthermore, we also anticipate that incidental take of Indiana bats will be difficult to detect because (1) dead or injured bats are rarely discovered due to the bat's small body size; and (2) the number of bats occupying a particular area at a particular time is highly variable and difficult to determine. Thus, it is appropriate to use a surrogate to monitor the level of take that occurs. While the Service typically uses the areal extent of potential roosting habitat affected as a surrogate to monitor the level of take, we suggest periodic monitoring of bat use of the action area. Such monitoring, described at the end of this section, will allow determination of the efficacy of the Conservation Measures described previously. If the conservation measures perform as expected, we do not believe incidental take will rise to the level of affecting the long term reproductive success or

viability of the colony using the action area.

This incidental take statement is based on 106 acres of habitat foregone in the impoundment, several single event clearings not to exceed an aggregate 3.4 acres for site construction and home development, removal of an undetermined number of suitable roost trees from street right-of-ways, and removal of an undetermined number of suitable roost trees that present human hazards on residential lots throughout the action area. Since the level of incidental take of Indiana bats resulting from non-lethal harm and harassment cannot be adequately quantified, incidental take will be estimated by the loss of roost trees potentially occupied by Indiana bats that are contained within the forested habitat estimated to be affected. These estimates of habitat alterations are described in the Direct Effects Summary preceding. While the proposed conservation measures described in the BA will ensure that effort will be taken to maintain remaining habitat suitability, actual habitat utilization of these areas remain to be determined until implementation of the reasonable and prudent measures that follow. This estimate is based on the removal of undiscovered roost trees, and long-term modification of habitat used by Indiana bats. Because male Indiana bats roost solitarily or in small groups, we believe that they are more likely to be exposed to impacts than are females which roost in more detectable numbers and which are expected to be protected by proposed conservation measures. Given the proposed conservation measures, we anticipate that the infrequent level of tree removal during the initial 5 years of development is likely to result in the take of less than 10 adult male bats per year over the first 5 years. This is based on the potential presence of 1 to 10 undetected males occupying 1 to 5 small trees removed by individual landowners as hazards, or removed during street rights of way. Management activities on the action area that prevent enactment of the conservation measures and/or would significantly increase the number of trees removed during the non-hibernation season would be considered to affect this determination and would require reinitiation of consultation. Such activities, should they occur, will be documented in monitoring reports described subsequently.

8.2 Effect of the Take

In the accompanying biological opinion, the Service determines that this level of expected take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

8.3 Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Indiana bat:

Implement afforestation immediately following authorization instead of spread over a 3 year period as proposed.

Where evidence of possible maternal colonies (lactating females or juveniles prior to August 15) is discovered, in addition to preserving the character of the colony site, the Service and Iowa DNR will be notified to determine the adequacy of conservation measures and determine the if project modifications are warranted. Recommendations for further site monitoring will be developed collaboratively between the Corps, Service, State, and applicant.

9. Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Act, the Corps of Engineers must comply with the following terms and conditions. These terms and conditions are non-discretionary.

1. Monitor afforestation success annually and replace diseased or dead stock for a period of 5 years following project authorization.
2. Monitor Indiana bat use of the action area every other year for 3 intervals (6 years) beginning no later than 2 years following completion of the afforestation plan. Prior to each

monitoring event, field work will be coordinated with the U.S. Fish and Wildlife Service Rock Island Field Office.

3. If site investigations or monitoring activities indicate that a maternity colony persists within the action area, roost areas used by the maternity colony(ies) will be identified and protected by establishing a zone centered on the maternity roosting area. The actual area will be determined by a combination of topography, known roost tree locations, proximity of permanent water, and a site-specific evaluation of the habitat characteristics associated with the colony. Protective measures shall be established by developing a management strategy in cooperation with the Service, Iowa DNR and the applicant. Strategies may include such things as survey/monitoring plans, site enhancement plans, or alternative site development plans.

9.1 Requirements for Monitoring and Reporting of Incidental Take of Indiana Bats

Federal agencies have a continuing duty to monitor the impacts of incidental take resulting from their activities (50 CFR 402.14(i)(3)). In doing so, the Federal agency must report the progress of the action and its impact on the species to the Service as specified below.

Supply the Service with biannual reports, due by December 31 of the 2nd, 4th and 6th year following project authorization that specifies:

1. The amount of suitable habitat cleared,
2. Progress and results of any terms and conditions that were required, identified by site-specific project, including the number of live or dead Indiana bats encountered, and age, sex, and reproductive status of live bats handled.

Care must be taken in handling dead bat specimens that are found on project lands to preserve biological material in the best possible condition.

Any dead specimens found should be placed in plastic bags and refrigerated as soon as possible following discovery.

The finding of any dead specimen should be reported immediately to the Service's Rock Island Field Office.

CLOSING

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 monitoring period, the level of incidental take described above is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency 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. For the purpose of this biological opinion the incidental take would be exceeded when the impacts to forest resources exceeds the 4.4 acre total approximated in project documents describing spillway, utility easement, and residential clearing; and/or the actions described in Conservation Measures preceding are not carried out as described.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the recommended plan provided in Public Notice CEMVR-OD-P-2006-532 and attendant documents for the Arbor Valley Lake development, Clarke County Iowa. The subject Public Notice was dated march 19 2007, and the Biological Assessment dated July 24, was received July 27, 2007. 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 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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