Biological Opinion and Incidental Take Statement for the Indiana bat (*Myotis sodalis*) at the Ohio Department of Transportation and the Montgomery County Transportation Improvement District Byers Road project (PID 79492) in Montgomery County, Ohio.

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Prepared by:

U.S. Fish and Wildlife Service
Ohio Ecological Services Field Office
4625 Morse Road, Suite 104
Columbus, OH 43230

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INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based on our review of the proposed Byers Road project in the City of Miamisburg and Miami Township, Montgomery County, Ohio, and its effects on the Indiana bat (*Myotis sodalis*) per section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The Federal Highway Administration's (FHWA) request for formal consultation was received on December 1, 2008, and formal consultation was initiated on December 1, 2008.

This biological opinion is based on information provided in the March 10, 2008 Ecological Survey Report; Service's May 12, 2008 project site visit; June 9, 2008 memo from LJB Inc. to Ohio Department of Transportation (ODOT); ODOT's July 3, 2008 letter to the FWS; Service's July 22, 2009 mitigation site review; numerous telephone conversations and e-mails between the FWS, ODOT, FHWA, and their representatives; and other sources of information. A complete administrative record for this consultation is on file at the Ohio Ecological Services Field Office (OHFO).

On January 26, 2007, the Service issued a programmatic biological opinion (PBO) to the FHWA on ODOT's Statewide Transportation Program through January 2012. The programmatic consultation established a tiered process for site-specific project review to 1) determine whether the effects of individual projects were fully considered in the PBO, 2) evaluate the appropriateness of project-specific avoidance, minimization, and mitigation measures, and 3) determine if any additional project-specific reasonable and prudent measures should be implemented to minimize incidental take. The Service also acknowledged in the PBO that projects may fall outside the scope of the programmatic consultation if the effects of these projects were not considered in the PBO.

An Ecological Survey Report (ESR) submitted by ODOT was received by the Service on April 11, 2008. In a subsequent letter, received at OHFO on July 3, 2008, ODOT determined that the project may affect, and is likely to adversely affect, the Indiana bat. ODOT requested Service concurrence on the determination through the Tier II programmatic consultation process. In a November 7, 2008 response letter, the Service concluded that the potential level of take that may result from this project could not be covered under the PBO, as the project will alter the character of the landscape such that reproductive output of an Indiana bat maternity colony could be adversely affected. The Service and ODOT met on November 21, 2008 to discuss the Service's position that this project falls outside the scope of the PBO.

CONSULTATION HISTORY

Table 1. Consultation History for the Byers Road project

Date	Event/Action
April 11, 2008	Concurrence request letter from ODOT (with NLAA determinations made for eastern massasauga rattlesnake, and Indiana bat) and March 10, 2008 Ecological Survey Report (produced by LJB Inc.) received at OHFO.
May 12, 2008	ODOT Office of Environmental Services (OES) and USFWS biologists conducted site visit and discovered 12 potential Indiana bat roost trees and 5 potential maternity roost trees within the southern/relocation segment of the project area.
June 2, 2008	LJB Inc. biologists reviewed areas not visited by ODOT and USFWS biologists; 12 additional potential roost trees and 0 additional maternity roost trees were identified by LJB in these other areas. These findings were reported in a June 9, 2008 memo from LJB to ODOT.
July 3, 2008	Concurrence request letter from ODOT, with LAA determination made for Indiana bat, received at OHFO.
July – August 2008	ODOT and the Service were negotiating a research credit mitigation agreement. Review of the MOT-Byers Road project was suspended, awaiting resolution of this agreement (as research credit could be applied to this project if approved).
September 4, 2008	Signed research credit mitigation agreement from ODOT received at OHFO.
October 27, 2008	Upon review of the draft concurrence letter prepared by the USFWS Transportation Liaison, the USFWS Endangered Species Coordinator at OHFO indicated that the project appeared to fall outside the scope of the Programmatic Biological Opinion between USFWS, FHWA, and ODOT.
November 7, 2008	USFWS sent letter to ODOT OES explaining the status of the project as outside the Programmatic BO.
November 21, 2008	USFWS staff met with ODOT OES to discuss details of the MOT-Byers Road project impacts.
December 1, 2008	Letter from FHWA requesting initiation of Formal Consultation received at OHFO.
December 8, 2008	USFWS sent letter to FHWA acknowledging receipt of their December 1 Formal Consultation initiation request.
January 13, 2009	Draft Biological Opinion emailed to FHWA (Columbus office) by OHFO.
January 13, 2009	FHWA forwarded Draft BO to ODOT for comment.
July 22, 2009	Service Transportation Liaison reviewed mitigation site and plan with ODOT OES biologist, LJB Inc. consultants, Five Rivers Metro Parks employees, and member of the Montgomery County Transportation Improvement District (MCTID).
September 1, 2009	ODOT provided comments on the Draft BO via email.

BIOLOGICAL OPINION

I. Description of the Proposed Action

ODOT and the Montgomery County Transportation Improvement District (MCTID) proposes to reconstruct a one-mile section of Byers Road, widening the existing two-lane road to five 12-foot-wide lanes, construct a curb-and-gutter roadway drainage system, and include a five-foot-wide sidewalk on the east side and a 10-foot-wide multi-use path on the west side of Byers Road. In addition, the project will relocate another one-mile segment of Byers Road west of the existing alignment to create a new intersection with Miamisburg-Springboro Pike opposite Wood Road. The relocated segment will also provide a five-lane roadway with curb and gutter, sidewalk, and multi-use path. The project site is located in the City of Miamisburg in Miami Township, Montgomery County, Ohio.

As stated in the ESR and ODOT's July 2008 letter to OHFO, the project will impact approximately 7.04 acres of forested habitat, 0.45 acre of riparian corridor, 23.8 acres of old field/meadows, 10.7 acres of roadside, and 1.34 acres of wetlands. The 7.04 acres of woodlots and wooded fence rows are part of a total connected forested area of greater than 100 acres and are estimated to constitute approximately 25% of the forested area within the vicinity of the project. Within these wood lots and fence rows, 12 suitable Indiana bat roost trees and 5 suitable maternity roost trees were identified. An additional 12 potential roost trees are located throughout the rest of the project area. All of these trees will be removed for the relocation of Byers Road.

In an effort to avoid and minimize impacts to ecological resources, ODOT planners worked with the local sponsor to study various conceptual alternative alignments. Using ecological field data, the ODOT planners and local sponsor refined the conceptual alternatives down to a few feasible alternatives for further study. Using stage one design, environmental data, and comments received from the various regulatory and resource agencies, the preferred alternative was selected.

ODOT and the MCTID will be implementing conservation measures for the purposes of avoiding, minimizing, and mitigating incidental take that may occur as a result of the proposed project. As described in their July 2008 letter and December 4, 2008 email, direct effects to the Indiana bat will be avoided by following a seasonal tree-cutting schedule, clearing trees only between September 30 and April 1 when the bats would be hibernating in caves and/or mines, and not using the forested habitat within the action area. ODOT and the MCTID will also minimize adverse effects by utilizing Best Management Practices (BMPs) to minimize water quality impacts due to sedimentation and erosion.

In addition, the following measures will be implemented to mitigate the adverse effects on the Indiana bat and to ensure that future habitat is available for the species.

ODOT, in partnership with the MCTID, entered into an agreement with the Five Rivers Metro Parks to enhance/restore wetlands, wetland buffer, and riparian corridor within Medlar Park on property owned by Miamisburg, Ohio. The specific mitigation proposed is outlined below.

The mitigation plans call for 3.0 acres of tree planting surrounding a 2.4 acre mitigation wetland, 1.0 acre of which will be forested wetland on Metro Park property; and 2.3 acres of honeysuckle removal and 0.7 acre of tree planting along a tributary to the Great Miami River on City of Miamisburg property.

Action Area

"Action area" is defined as all areas that will 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 defined by measurable or detectable changes in land, air and water or to other measurable factors that may elicit a response in the species or critical habitat. The action area is not limited to the "footprint" of the action and should consider the chemical and physical impacts to the environment resulting from the action.

The Service determined the action area for this project based upon the biotic, chemical, and physical impacts to the environment that are anticipated due to the project. The area directly affected by the action is the 31.55 acres where all construction, operation, and maintenance activities will occur. The area indirectly affected by the action includes area affected by noise and vibrations and impacts to surface water resources outside of the 31.55 acres.

Noise and vibrations are physical impacts to the environment that will be caused by construction and operation of the proposed roadway, and will vary in intensity depending upon the source. Clearing and grubbing of the site will generate noise during site preparation and construction equipment will generate noise throughout the duration of construction. The level of noise generated from the different construction and maintenance activities will vary depending upon the methods and equipment being used or operated. Operational noise will be generated by vehicle operation during construction, and day-to-day vehicular traffic will generate noise once construction has been completed, although due to the close proximity of the project site to the existing Byers Road and other roads, including Interstate 75, a significant change from the current ambient noise levels, post construction, is not expected.

Current ambient noise within the proposed 31.55 acre site varies depending on proximity to roads and adjacent properties, with the lowest noises expected near the centers of the two large woodlots in the area of proposed relocation, and the loudest noises expected adjacent to existing Byers Road, Interstate 75, and Miamisburg-Springboro Pike Road due to traffic. The Service estimates that current ambient noise levels are approximately 50 dBA (approximately the loudness of a clothes dryer when standing next to it) (FHWA 2006) at the quietest location onsite.

The highest project noise levels are expected to occur during the clearing and construction activities. Logging activities typically involve sawing equipment which can generate high noise levels (for example, chainsaws can generate a noise level of 110 dB). Typical construction noise levels are at an average of 85 dBA at 50 ft from the source (D. Snyder, FHWA, personal communication, January 7, 2009), with the peak noise level for most construction equipment at or below 95 dBA (FHWA 2006). To put these noise levels into perspective, normal human

conversation measures about 60 dBA. In general, human sound perception is such that a change in sound level of 3 dBA is just noticeable, a change of 5 dBA is clearly noticeable, and a change of 10 dBA is perceived as a doubling or halving of sound level (FHWA 2006).

The average noise level produced during project construction is estimated to be 85 dBA at 50 ft from source (D. Snyder, FHWA, personal communication, January 7, 2009). Operational noise will be generated by vehicular traffic once construction has been completed, although due to the close proximity of the project site to the existing roads, a significant change from the current ambient noise levels post construction is not expected.

The effects of noise are expected to occur approximately 3200 feet outside of the 31.55 acre project footprint, based on the following assumptions:
(1) The noise level at the quietest location on the property is estimated to be 50 dBA (approximately the loudness of a clothes dryer when standing next to it) (FHWA 2006)
(2) Noise level of construction equipment is approximately 85 dBA at 50 feet from the source (D. Snyder, FHWA, pers. comm.)
(3) Noise decreases by approximately 5 dBA per doubling of distance from source over soft ground with heavy vegetative ground cover (Dave Snyder, FHWA, personal communication, January 7, 2009)

Based on these assumptions, construction noise of 85 dBA at the edge of the property line would travel up to 3200 feet beyond the property line before the distance traveled by the noise reduces it to 50 dBA.

Impacts to surface waters are anticipated from the project. Wetlands and streams will be directly and indirectly affected within the project footprint during the construction phase of the project. Also, some surface waters outside of the actual project footprint could be indirectly affected from the project due to the anticipated change in the volume of pollutants entering the environment (e.g., sediment and runoff from impermeable surfaces) and the alteration of surface water drainage patterns. The physical, chemical, and biological nature of some of these wetlands and streams will be altered by various activities such as grading and filling.

ODOT estimates that 1.34 acres of Category I and Category II wetlands will be directly impacted by the project. This estimate is comprised of five individual wetlands: 0.65 acre of abutting/adjacent wetlands (2) and 0.69 acre of isolated wetlands (3). As three of the wetlands are isolated from other waterbodies, no indirect “downstream” impacts are anticipated from filling of these wetlands. However, the capacity of these wetlands for providing important ecosystem functions (e.g., providing wildlife habitat, flood and erosion control, and water quality functions) will be reduced. This is particularly notable for the one Category II wetland, which serves a significant water filtration function for the surrounding land. However, reduction in capacity for this function is expected to be minimal, as only 0.6 acre of the nearly 7-acre wetland will be impacted by the project. In addition to these wetland impacts, the project will relocate an existing retention pond, which was previously constructed by a private developer, without authorization, through an adjacent, jurisdictional wetland. Approximately 0.65 acre of that provisionally classified Class I wetland will now be impacted by this relocation.

The project is also estimated to impact 250 linear feet of a Class II PWWH stream. Approximately 0.04 acre of the stream will be impacted below the ordinary high water mark (OHWM), using the average width of 6.4 feet at the OHWM. Increased sedimentation is expected both within and outside the project area during construction. However, these effects should be temporary, with stream recovery and re-colonization by preconstruction fauna expected within two years following construction. Permanent long term impacts to aquatic habitat are expected due to fill and culvert placement where the road will cross the stream in the southern segment of the project area.

In summary, the Service defines the action area for the proposed Byers Road project as the 31.55-acre project footprint plus an additional 3200-foot area surrounding the property that will be temporarily affected by construction noise. Once construction is complete, only minor localized increases in noise due to typical vehicle operation are anticipated.

II. Status of the Species

The Indiana bat was officially listed as an endangered species on March 11, 1967 (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966 (80 Stat. 926; 16 U.S.C. 668aa[c]). The Endangered Species Act of 1973 extended full protection to the species. Thirteen winter hibernacula (11 caves and 2 mines) in 6 states were designated as critical habitat for the Indiana bat in 1976 (41 FR 187). The Service has published a recovery plan (USFWS 1983) which outlines recovery actions. Briefly, the objectives of the plan are to: (1) protect hibernacula; (2) maintain, protect, and restore summer maternity habitat; and (3) monitor population trends through winter censuses. The recovery plan is currently under revision.

The Indiana bat population was estimated at 883,300 bats when the species was listed as Federally Endangered in 1967. Rangewide population estimates have been calculated since 1965, with the estimate declining through 2001. The species population was estimated to have decreased 23 percent from 1960/70 – 1980, 30 percent from 1980 – 1990, and 19 percent from 1990 – 2000. The highest declines have been observed in the Southern part of the species range. Current data (USFWS 2008) indicate an increasing trend in the rangewide population from 2001 – 2007, with an estimated population of 328,410 in 2001 increasing to 468,184 in 2007. Although this trend could reflect real increases in the Indiana bat population, moving toward recovery, additional data is needed before such an interpretation can be affirmed (see additional information in the *Rangewide Status* section of this report).

Description and Distribution

The Indiana bat is a medium-sized bat, closely resembling the little brown bat (*Myotis lucifugus*) but differing in coloration. There are no recognized subspecies. The Indiana bat has been found in 27 states throughout much of the eastern United States (USFWS 1999). More specifically, NatureServe (2004) describes its range as going from eastern Oklahoma, north to Iowa, Wisconsin, and Michigan, east to New England and south to western North Carolina, Virginia, and northern Alabama. It is virtually extirpated in the northeastern United States. The Indiana bat is migratory, and the above described range includes both summer and winter habitat. Major populations of this species hibernate in Indiana, Kentucky, and Missouri, with smaller

populations reported in Alabama, Arkansas, Georgia, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. The majority of maternity colonies are located in the glaciated Midwest.

The Indiana bat is a member of the *Myotis* genus, and is quite small, weighing only three-tens of an ounce (USFWS 2002). In flight, it has a wingspan of 9 to 11 inches. The fur is dark brown to black and the bat is similar in appearance to many other related species (USFWS 2002). The most well recognized difference between Indiana bats and other similar *Myotis* species is that Indiana bats have a distinctly keeled calcar (cartilage that extends from the ankle to support the tail membrane). There are other minor differences, such as Indiana bats having smaller, more delicate feet, shorter feet hairs that do not extend past the toenails, and a pink nose.

Life History and Population Dynamics

The lifespan for Indiana bats is generally between 5 and 10 years (Thomson 1982), but individuals may live much longer, with the oldest known bat captured 20 years after it was first banded (LaVal and LaVal 1980).

The key stages in the annual cycle of Indiana bats are: hibernation, spring staging, pregnancy, lactation, volancy/weaning, migration, and swarming. While varying with weather and latitude, generally bats begin winter torpor in mid-September through late October and begin emerging in April. Females depart shortly after emerging and are pregnant when they reach their summer area. Birth of young occurs between mid-June and early July and then nursing continues until weaning, which is shortly after young become volant in mid to late July. Migration back to the hibernacula may begin in August and continue through September. Males depart later from the hibernacula and begin migrating back earlier than females.

<u>Hibernation</u>
Generally, Indiana bats hibernate from October through April depending upon local weather conditions. Bats cluster on cave ceilings during hibernation and are capable of clustering in densities ranging from 300-484 bats per square foot. Hibernation facilitates survival during winter when prey are unavailable. However, the bat must store sufficient fat to support metabolic processes until spring. Substantial risks are posed by events during the winter that interrupt hibernation and increase metabolic rates.

Temperature and relative humidity are important factors in the selection of hibernation sites. During the early autumn, Indiana bats roost in warm sections of caves and move down a temperature gradient as temperatures decrease. In mid-winter, Indiana bats tend to roost in portions of the cave where temperatures are cool (37-43^{o} F). Long-term data suggest an ideal temperature range for hibernacula is between 3-6^{o}C (USFWS 1999). A recent study of highly populated hibernacula documented a temperature range of 3-7.2^{o}C (Tuttle and Kennedy 2002). Relative humidity in Indiana bat hibernacula is usually above 74% but below saturation (Hall 1962; Humphrey 1978; LaVal et al. 1976), although relative humidity as low as 54% has been observed (Myers 1964).

Spring Staging

After hibernation ends in late March or early April, most Indiana bats migrate to summer roosts. Female Indiana bats emerge from hibernation prior to males. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs (Hall 1962; Cope and Humphrey 1977). Most bats leave their hibernaculum by late April. Migration is stressful for the Indiana bat, particularly in the spring when their fat reserves and food supplies are low and females are pregnant. As a result, adult mortality may be highest in late March and April (Thomson 1982).

Female Maternity Colony and Summer Roosting Habitat

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies (USFWS 1999). Coloniality is a requisite behavior for reproductive success. Females usually start grouping into larger maternity colonies by mid-May and give birth to a single young between late June and early July (Humphrey et al. 1977). These colonies are typically located under the sloughing bark of live, dead and partially dead trees in upland and lowland forest (Humphrey et al. 1977; Gardner et al. 1991). Colony trees are usually large-diameter, standing dead trees with direct exposure to sunlight. The warmer temperature from sunlight exposure helps development of fetal and juvenile young (USFWS 1999). A maternity roost may contain 100 or more adult females and their pups.

Roost trees often provide suitable habitat as a maternity roost for only a short period of time. Roost trees are ephemeral in nature; suitable trees fall to the ground or lose important structural characteristic such as bark exfoliation (Gardner et al. 1991; Britzke et al. 2003). Dead trees retain their bark for only a certain period of time (about 2-8 years). Once all bark has fallen off a tree, it is considered unsuitable to the Indiana bat for roosting. Gardner et al. (1991) found that 31% of Indiana bat occupied roost sites were unavailable the summer following their discovery; 33% of the remaining occupied roost sites were unavailable by the second summer.

However, female Indiana bats have shown strong site fidelity to their summer maternity grounds, and will use suitable roost trees in consecutive years, if they remain standing and have sloughing bark (Gardner et al. 1991; Callahan et al. 1997; Kurta and Murray 2002). Traditional summer sites are essential to the reproductive success of local populations. It is not known how long or how far female Indiana bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded. If they are required to search for new roosting habitat, it is assumed that this effort places additional stress on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration.

It is unknown how many roosts are critical to the survival of a colony, but the temporary nature of the use of the roost trees dictates that several must be available in an area if the colony is to return to the same area and raise their young successfully. Indiana bats require many roost trees to fulfill their needs during the summer (Callahan et al. 1997). In Michigan, Indiana bats used two to four different roost trees during the course of one season (Kurta and Williams 1992). In Missouri, each colony used between 10-20 roost trees, and these were not widely dispersed (all within a circle ranging in size from 0.81 to 1.48 km) (Miller et al. 2002). The important factor associated with roost trees is their ability to protect individuals from the elements, and to provide thermal regulation of their environment. Maternity colonies have at least one primary roost,

which is generally located in an opening or at the edge of a forest stand (USFWS 1999). Maternity colonies also use multiple alternate roosts which are located in the open or in the interior of forest stands (USWFS 1999). Exposure to sunlight is important during development of fetal and juvenile young. In Missouri, use of dead trees in the forest interior increased in response to unusually warm weather (i.e., shading provided a cooler thermal environment), and use of live trees and snags in interior forest increased during periods of precipitation (Miller et al. 2002). Maternity colonies in North Carolina and Tennessee used roosts located above the surrounding canopy (Britzke et al. 2003).

Roost trees vary in size. The minimum diameter reported so far is 2.5 inches dbh for a tree used by males (Grumbert 2001) and 4.3 inches dbh for one occupied by females (Britzke 2003), such small trees have not been documented as primary roosts. The average diameter of roost trees used by maternity colonies (primary and alternate) is 24, 22, and 16 inches for Indiana, Missouri, and Michigan, respectively (Callahan et al. 1997, Kurta and Rice 2002, Whitaker and Brack 2002). The smallest mean diameter of roost trees used by a colony is 11 inches which is for five trees in Pennsylvania; however, the primary roost for this colony was a building, and no tree sheltered more than four bats (Butchkoski and Hassinger 2002). Kurta (2005) analyzed 393 roost trees from 11 states and found that the average diameter of maternity roost trees is 18 inches.

Larger-diameter trees presumably provide thermal advantages and more spaces for more bats to roost. As with most tree-roosting bats (Hayes 2003, Barclay and Kurta 2007), female Indiana bats probably select trees, especially primary roosts, that are larger in diameter than nearby apparently suitable, but unoccupied trees (Kurta et al. 1996, 2002; Britzke et al. 2003; Palm 2003; Sparks 2003).

Indiana bats have been found roosting in several different species of trees, and it appears that they choose roost trees based on their structural composition. Therefore, it is difficult to determine if one particular species of tree is more important than others. However, 12 tree species have been listed in the Habitat Suitability Index Model as primary species (class 1 trees) (Rommé et al. 1995). These trees include silver maple (*Acer saccharinum*), shagbark hickory (*Carya ovata*), shellbark hickory (*C. laciniosa*), bitternut hickory (*C. cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*F. americana*), eastern cottonwood (*Populus deltoides*), red oak (*Quercus rubra*), post oak (*Q. stellata*), white oak (*Q. alba*) slippery elm (*Ulmus rubra*), and American elm (*Ulmus americana*). In addition to these species, sugar maple (*A. saccharum*), shingle oak (*Q. imbricaria*), and sassafras (*Sassafras albidum*) are listed as class 2 trees (Rommé et al. 1995). The class 2 trees are those species believed to be less important, but that still have the necessary characteristics to be used as roosts. These tree species are favored by the Indiana bat, since as these trees age, their bark will slough.

During a fall survey in Kentucky in 1994 and 1995, female Indiana bats utilized sourwood (*Oxydendrum arboreum*) and pignut hickory as roost trees and were found to roost singly (Kiser and Elliott 1996). The females' trees were between 6 and 10 inches in diameter and contained bark cover between 54 and 70 percent. Females tended to roost within 0.75 miles of the hibernacula, whereas males roosted anywhere from 0.95 to 2.35 miles from the hibernacula. Both males and females were found to use 2 to 3 roost trees for 2 to 3 days at a time (Kiser and

Elliott 1996). Britzke et al. (2003) documented the use of conifers by maternity colonies in the mountains of Tennessee and North Carolina.

Male Roosting Habitat

Some adult males use mature forests around and near their hibernacula for roosting and foraging from spring through fall. However, some male bats have been found to leave the hibernacula area completely (USFWS 1999). Male Indiana bats have been found to use the same habitat in subsequent years (USFWS 1999).

Roost trees are primarily dead snags on upper slopes or ridgetops, however live shagbark hickory and pignut hickory (*Carya glabra*) trees have been recorded as roost trees. Male Indiana bats have been found to roost singly during autumn in scarlet oak (*Quercus coccinea*), Virginia pine (*Pinus virginiana*), red maple (*Acer rubrum*), shagbark hickory, and red oak. These trees ranged in diameter from 4.6 to 26 inches, with and average diameter of 13 inches, and had bark coverage ranging from 1 percent to 100 percent. However, the majority of the roost trees had bark coverage of at least 60 percent (Kiser and Elliott 1996).

During a 1999 radio telemetry survey on the Athens District of the Wayne National Forest, males were found roosting in American elm, red maple, shagbark hickory, and sugar maple trees. The average dbh of these trees was 11.8 inches and the average length of time each tree was used was 2.3 days (Schultes 2002). In 2000, two male Indiana bats were found roosting in American elm, red maple, black oak (*Quercus velutina*), white oak, pignut hickory and shagbark hickory. The average dbh of these trees was 11.9 inches and the average length of time each tree was used was 1.9 days (Schultes 2002).

Foraging

Indiana bats feed exclusively on flying aquatic and terrestrial insects. Although there are no consistent trends, diet appears to vary across their range, as well as seasonally and with age, sex and reproductive-status (Murray and Kurta 2002; 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%) (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.

Foraging habitat for male and female Indiana bats in the core of its range is assumed to include forest habitats with open understories and canopy closures of 50 to 70 percent (Romme et al. 1995). However, other foraging habitat includes upland, bottomland, and riparian woodlands, as well as forest and cropland edges, fallow fields, and areas of impounded water (Kiser and Elliott

1996). Other studies are showing that summer roosting and foraging areas, in parts of its range, can contain diverse cover types, including agricultural lands, residential areas, and open woodlands (Carter et al. 2002; Farmer et al. 2002; Miller et al. 2002).

Females tend to use larger foraging areas than males during the summer. One study recorded a post-lactating female as having a foraging range of approximately 530 acres; males had an area of approximately 140 acres (Kiser and Elliott 1996). New information from a Michigan study documented pregnant and lactating females traveling up to 2.6 miles from the day roost to foraging areas (Murray and Kurta 2004). Observations by Murray and Kurta (2004) indicated that female Indiana bats would not fly over open areas between foraging areas on the northern edge of its range in Michigan, but appeared to follow wooded corridors described as a narrow fence line of mature trees. This data indicates that wooded corridors, even narrow ones, may provide an important link between roosting and foraging areas for the Indiana bat.

During summer months, some males remain near the hibernacula and forage along floodplain pastures, within dense forests and on ridge tops. Male Indiana bats generally travel between 1.2 and 2.6 miles from their summer roosts to summer foraging areas (USFWS 1999). A separate study indicated male Indiana bats have a minimum foraging area size of about 400 acres and a high use area size of 115 acres (Kiser and Elliott 1996).

During the fall, male bats were found to forage in upland, ridgetop forest as well as valley and riparian forest areas (USFWS 1999). Male Indiana bats tend to use larger foraging areas during autumn than in summer. However, female bats use even larger autumn foraging areas than males. During October, males were observed to be traveling between 0.89 and 1.5 miles to forage (Kiser and Elliott 1996).

Home Range

Indiana bats are known to occupy distinct home ranges, particularly in the summer (Garner and Gardner 1992). However, relatively few studies have determined the home ranges of Indiana bats, and these studies based their calculations on a small number of individuals. Further, direct comparison of the home range estimates between studies is difficult due to different methodologies used in collecting the data, inconsistency in terminology, and different methods of calculating home range size (Lacki et al. 2006). Home range size varies between seasons, sexes, and reproductive status of the females (Lacki et al. 2006). Standardized methodology and terminology as well as additional research will be necessary in order to further refine home range estimates.

Kiser and Elliot (1996) identified minimum foraging areas for 15 Indiana bats (14 males, 1 female) at a hibernaculurn in Kentucky. Their estimates ranged from approximately 28 to 267 ha (69 to 734 acres) (excluding the cave in the estimate), with a mean of 156 ± 101 ha (385 ± 249 acres). Romme et al. (2002) calculated a mean home range near a hibernaculurn in Missouri of 667 ± 994 ha (1,648 ± 2456 acres) for spring and fall (based on pooled data for nine bats-male and female) and 1,584 ± 1,424 ha (3,825 ± 3,518 acres) for fall home range (based on three males). In Virginia, Brack (in press) calculated average active areas for three females and eight males near a hibernaculum as 250 ± 100 ha (618 ± 247 acres) (n=1 1) using mean convex polygons and 361 ± 259 ha (892 ± 640 acres) (n=10) using adaptive kerneling (core areas).

Menzel et al. (2005) tracked seven female and four male Indiana bats from May to August in Illinois. No significant differences in home ranges between males and females were observed and home range estimates were subsequently grouped. Menzel et al. (2005) determined the mean summer home range size of Indiana bats to be 145 ha (357 acres). Watrous et al. (in press) calculated a mean home range of 83 ha (205 acres) for 14 female Indiana bats in Vermont.

Fall Swarming and Mating

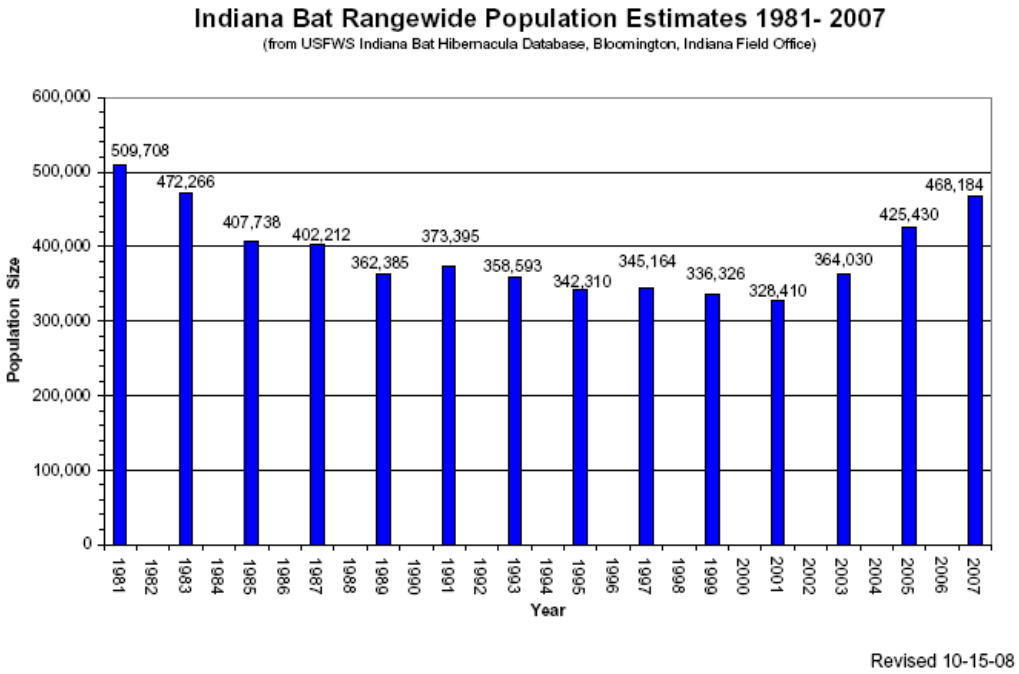
From late-August to mid-October, prior to entering the hibernacula, large numbers of Indiana bats fly in and out of cave or mine openings from dusk till dawn in a behavior called swarming. Swarming usually lasts for several weeks and mating occurs toward the end of this period. Male Indiana bats tend to be active for a longer period of time than females during swarming and will enter the hibernacula later than the females (USFWS 1999). Adult females store sperm through the winter thus delaying fertilization until early May.

Range-wide Status

The Indiana bat geographic range includes most of the eastern and Midwestern United States. It occurs from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida (Barbour and Davis 1969). The majority (85%) of the range-wide population hibernates in ten Priority 1 (P1) hibernacula (sites that contain more than 30,000 individuals), which are located in Indiana (three sites), Kentucky (four sites), and Missouri (three sites). Priority 2 (P2) colonies (containing between 500 and 30,000 bats) are located in Arkansas, Illinois, New York, Ohio, Tennessee, Virginia, and West Virginia as well as in the Priority 1 States (USFWS, 1999).

Range-wide estimates of species numbers over the three most recent survey periods do not show the same declining trend seen in estimates spanning 1965-2000 (Figure 4). There is a 10% increase from the 2005 estimate of 425,430 bats to the 2007 estimate of 468,184 bats (USFWS 2008). Unfortunately, the interpretation of this apparent increase is somewhat confounded at this point in time because there has yet to be developed and implemented a standardized approach of measuring sources of variability and observer error in association with the standard winter survey methodology. Therefore, the different time frames, changes in methodology over time, and insufficient information on accuracy and variability of individual cave estimates make statistical testing of these differences inappropriate. Even so, because the individual biologists that have been conducting the winter bat surveys at high priority hibernacula have been very consistent over the past 20 years, there is some basis for believing the recent upward trend may in fact reflect reality.

Figure 2. Indiana bat rangewide population estimates (USFWS 2008)



Threats to the Species

The causes for the population decline of the Indiana bat have not yet been definitively determined. However, the documented and suspected reasons for decline include disturbance and vandalism; improper cave gates and structures; natural hazards; microclimate changes; adverse land use practices; and chemical contamination.

Human disturbance of hibernating bats led to a decline in Indiana bat populations from the 1960s to the 1980s (USFWS 1999). Disturbance from recreational cavers and researchers entering hibernacula can cause bats to expend crucial fat reserves before they are able to forage in the spring. If disturbance occurs too often, fat reserves can be depleted before the species can begin foraging in the spring.

Changes in the microclimate of a cave or mine can affect temperature and moisture level, thereby affecting suitability of the hibernaculum or affecting bat physiology (Richter et al. 1993; Tuttle and Kennedy 2002). Blockage of entry points can alter airflow in a cave or mine. This poses serious consequences when a hibernaculum is on the warm edge of the species hibernating tolerance, or has less stable temperatures. In northern areas, changes in airflow could lead to areas of the mine or cave being too cold for the bat. In either case, changes in airflow and the microclimate could result in individuals having to use less optimal locations in the hibernaculum. This could leave them vulnerable to predation, freezing, or exhaustion of fat reserves. Improper gates have either rendered hibernacula unavailable to the Indiana bat, or have altered air flow causing hibernacula temperatures to be too high for bats to retain fat reserves through the winter (USFWS 1999). Cave entrances essential to proper cooling of key hibernating sites must be identified and protected from inadvertent closures, including those that may occur naturally (Tuttle and Kennedy 2002).

Natural hazards including flooding, freezing during severe winters, and ceiling collapse have caused the loss of Indiana bats (USFWS 1999). Indiana bats have been drowned by flooding of caves or mines, either by river flooding or changes in subsurface and surface hydrology. Severe weather can affect bats roosting in summer habitat. There has been a documented occurrence of strong winds and hail stripping bark from a tree, forcing the bats to move to another roost (USFWS 1999). This could occur during summer roosting, or during migration.

Land use practices, fire suppression, and agricultural development have reduced available roosting and foraging habitat as well as reduced the abundance of insects for bat prey across its range. Ongoing research and monitoring is helping to enhance the understanding of habitat use and characteristics. When done properly, experts consider forestry practices to be compatible with Indiana bat conservation; however silvicultural methods need to maintain structural features important for roosting and foraging (BCI 2001).

Bioaccumulation of environmental contaminants is suspected as a potential factor in the decline of the Indiana bat (USFWS 1999). Organochlorine insecticides became widely used after World War II; they are neurotoxic, synthetic chemicals of which many are resistant to metabolism in mammals (O'Shea and Clark 2002). Organochlorine insecticides may have resulted in chronic mortality of Indiana bats (O'Shea and Clark 2002). For example, guano collected from an Indiana bat roost in Indiana, in the 1970s, had concentrations of dieldrin in their guano comparable to the levels found in colonies of gray bats that suffered mortality from dieldrin poisoning (O'Shea and Clark 2002). Schmidt et al. (2002) measured levels of Polycyclic Aromatic Hydrocarbons (PAH) and organochlorine pesticides in surrogate bat species to ascertain potential affects to the Indiana bat. At low concentrations, these chemicals cause cancer and cellular mutations in mammals, and may affect reproductive success by reducing viability of gametes or offspring. In this Missouri study at Fort Leonard Wood, all red bats and eastern pipistrelles had detectable concentrations of DDE, heptachlor epoxide and PAHs, and many had measurable amounts of dieldrin

In 2007, white nose syndrome (WNS) was found to fatally affect several species of bats, including the Indiana bat in eastern hibernacula. To date, WNS is known from Connecticut, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and West Virginia (all within the Northeast Recovery Unit, as proposed by the 2007 Indiana Bat Draft Revised Recovery Plan). Roughly 70,000 Indiana bats, approximately 15% of the total population, occur in the affected states and are vulnerable to WNS at this time. The extent of the impact this syndrome may have on the species rangewide is uncertain, but based on our current limited understanding of WNS, we expect mortality of bats at affected sites to be high (pers. com, L. Pruitt, 2008).

III. Environmental Baseline

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem, within the ***action area.*** *It includes a description of the status of the species within the* ***action area****.*

The action area that encompasses the Byers Road project site is located in a mixed-use area of southern Montgomery County, Ohio. This encapsulates forested areas, agricultural fields, local

park land, and developed areas including roads, parking lots, and residential and commercial properties.

The Byers-Road project area consists of residential properties, second growth forest, wetlands, streams, and farm fields. The site is within the Great Miami River watershed (HUC 05080002-020), but is not located within any 100-year floodplains. The project area is located within a hydrogeologic setting characterized by till over bedded sedimentary rock at the northern end and thin deposits of till overlying layers of limestone and shale in the southern portion. Bedrock is the principal groundwater aquifer in the northern section, with some small supplies of groundwater in the southern section of the area. The silt loam soil within the action area consists of the following types: Brookston (Bp), Celina (CeB), Corwin (CoB), Crosby (CsA), Miamian (MIB, MIB2, MIC2, MID2), and Ritchey (ReC2). These include two of three soil series in which the finest hardwood tree species reportedly grow, Celina and Miamian.

The project area has been substantially disturbed in the past. Aerial photos from 1938 show the majority of the action area in agricultural use. However, by 1980, photos reveal that several woodlots had developed in inactive farm fields and undeveloped areas. By 2000, although still largely agricultural, narrow riparian corridors had formed around streams, and woodlots greater than 1 acre in size had developed on wetter soils.

Trees within the approximately 31.55-acre project area are located primarily within two large woodlots (approximately 25 acres each in size), fence rows, riparian corridor, residential areas, and alongside existing roads. The woodlots vary in composition, and are both considered successional hardwood forests. Tree species within the woodlots include black walnut, hackberry, cottonwood, shagbark hickory, and slippery elm. Box elder, green ash, and hackberry are the dominant species within the riparian corridor. A wide variety of tree species occur along the un-mowed sections of the roadway, including green ash, silver and sugar maples, sycamore, and cottonwood. As described in the *Life History* section of this report, cottonwoods, shagbark hickories, slippery elms, green ashes, and silver maples are considered primary (class 1) species of roosting trees for Indiana bat maternity colonies (Rommé et al. 1995). In addition, sugar maples, although believed to be less important (a class 2 species), also have the necessary characteristics to be used as roosts (Rommé et al. 1995).

Four-hundred-eighty feet of a relatively permanent stream with an intermittent, seasonal flow regime runs north-to-south through the project area, flowing through both large woodlots. The stream scored 54 on the Headwater Habitat Evaluation Index, classifying it as a Class II Primary Headwater Habitat. The drainage area is approximately 0.8 square miles, and the stream eventually converges with Clear Creek, which drains into the Great Miami River (an Ohio EPA designated warm water habitat (WWH)). A narrow but well-developed riparian corridor, with 90% canopy closure, surrounds the stream within the project area. Active and inactive agricultural fields lie beyond the corridor in all directions. Although the pH of the stream falls within the optimal range for aquatic species, it is unlikely to sustain sensitive species due to high conductance and a low level of dissolved oxygen.

Eight wetlands, totaling 10.03 acres, are present within the project area: five isolated and three directly or indirectly connected to the stream. Four of the wetlands are Category II (two isolated,

two not isolated) and four are Category I. Except for one wetland, classified as emergent/early successional, all are palustrine forested/emergent wetlands.

Current ambient noise within the proposed 31.55 acre site varies depending on proximity to roads and adjacent properties, with the lowest noises expected near the centers of the two large woodlots in the area of proposed relocation, and the loudest noises expected adjacent to existing Byers Road, Interstate 75, and Miamisburg-Springboro Pike Road due to traffic. The Service estimates that current ambient noise levels are approximately 50 dBA (approximately the loudness of a clothes dryer when standing next to it) (FHWA 2006) at the quietest location onsite.

Status of the Species within the Action Area

ODOT's July 2008 letter and ESR indicated that suitable roosting and foraging habitat for the Indiana bat exists onsite. Twelve trees exhibiting characteristics suitable for roosting and five potential maternity roost trees are located within the portion of the project area where the relocated segment of Byers Road will be constructed. An additional 12 potential roost trees are located throughout the rest of the project area.

No mist nest survey was conducted onsite; therefore, presence of the Indiana bat is assumed.

Factors affecting species environment within the Action Area

Development

Both current and past, commercial and residential development have been identified within the action area. The proposed action will result in the permanent loss of 7.04 acres of roosting and foraging habitat for the Indiana bat. Two residential subdivisions, Byers Ridge and Crain's Run, have been developed along the western edge of the action area within the past decade (March 10, 2008 ESR). It is likely that this past development resulted in a loss of suitable Indiana bat roosting and/or foraging habitat.

IV. Effects of the Action

In evaluating the *effects of the action*, section 7 of the Endangered Species Act and the implementing regulations (50 CFR §402) require the Service to consider both the direct and indirect effects of the action on the species, together with the effects of other activities that are interrelated or interdependent with the action that will be added to the environmental baseline. *Direct effects* are those effects that have immediate impacts on the species or its habitat while *indirect effects* are those that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. *Interrelated actions* are those that are part of a larger action and depend on the larger action for project justification. *Interdependent action*s are those actions that have no independent utility apart from the action under consideration.

The *effects* evaluation is necessary to make the required determination under 7(a)(2), of insuring the Federal action does not jeopardize the continued existence of the species, or result in the

destruction or adverse modification of designated critical habitat. *Jeopardize the continued existence* of a species means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. The following analysis will evaluate the effects of the proposed project in relation to the reproduction, numbers and distribution of the Indiana bat within the action area, and then further evaluate these effects in the context of the overall range-wide species status and cumulative effects to the species.

Beneficial Effects

ODOT, in partnership with the MCTID, and Five Rivers Metro Parks, proposes to develop and enhance roosting and foraging habitat for the Indiana bat by planting trees and/or restoring riparian corridors on property owned by the Five Rivers Metro Parks and the City of Miamisburg. A total of 7 acres of habitat will be restored in this way and preserved in perpetuity.

The Ohio Environmental Protection Agency has established Ohio Water Quality Standards that address wetland mitigation criteria in the state of Ohio. These standards require wetland mitigation at or above a ratio of 1.5:1 (ODOT 2004). Mitigation at or above a 1.5:1 ratio could replace and enhance habitat for the Indiana bat by increasing the quantity and quality of foraging habitat.

Direct Effects

Direct adverse effects to the bat have been largely avoided by ODOT and the MCTID's proposed timeframe for tree clearing. ODOT and the MCTID propose to remove trees only between September 30 and April 1, when the bats would be hibernating in caves and/or mines, and not using the forested habitat within the action area. Therefore, the Service anticipates that no direct take (killing or injuring) of the Indiana bat will occur due to tree removal.

Indiana bats remaining in the action area during construction will be subject to noise disturbance from clearing, grading, and construction activities. As a result, Indiana bats in the action area will be exposed to noise levels or intensity of noise and vibrations that they may not have experienced in the past, depending on the proximity of their roost sites to other human activities nearby.

The current ambient noise within the action area varies greatly depending upon the proximity of the given area to existing activities. Portions of the action area are heavily developed with roads parking lots, or residential or commercial structures, and noise surrounding these areas would be significantly greater than the noise at the center of the woodlots in the proposed Byers Road relocation area.

In general, the increased noise and vibrations could cause disturbance to Indiana bats unaccustomed to these impacts while roosting and thereby lower the suitability of habitat adjacent to the project area. It is difficult to predict the degree to which Indiana bats would be

disturbed by the noise and vibrations associated with construction activities. Some studies suggest that bats avoid noisy areas. Female bats in Illinois, for example, used roosts at least 1,640 feet from paved roadways (Garner and Gardner 1992).

Other studies suggest that bats may be able to tolerate disturbance from noise. Indiana bats were documented to use roosts near the I-70/ Indianapolis Airport area, including a primary maternity roost tree south of I-70 at the edge of the airport. This roost was not abandoned despite constant noise from the Interstate and airport runways; however, their proximity to the Interstate could also have been due to lack of a more suitable roosting area (USFWS 2002). On Crane Naval Surface Warfare Center in Indiana, a female Indiana bat used a roost tree only 436 ft from a two-lane road. In the Hoosier National Forest in Indiana, a male Indiana bat was located roosting on the edge of the Interstate 64 right-of-way.

Some studies indicate that Indiana bats may be somewhat tolerant of noise from busy roads. Yet, other studies indicate that bats may select roosts somewhat removed from these noisy areas. Any impact resulting from noise and vibrations related to construction activities would be expected to result in bats selecting roost trees further from the disturbance. It is reasonable to assume that this will occur when taking the conservative analytical approach.

The highest project noise levels are expected to occur during the clearing and construction activities. The area that will experience the greatest increase in noise during construction will be near the large woodlots in the southern portion of the project area, where the current noise levels are the lowest. The Service estimates that the area impacted by noise disturbance during construction could encompass an area up to 3,200 feet from the actual work limits.

The noise level anticipated during project operation is around 51.3 dBA (LJB, Inc. 2008 Traffic Noise Analysis Report).

We anticipate that impacts from noise generated during construction and operation of the relocated segment of Byers Road will be insignificant and discountable.

Indirect Effects

Indirect adverse effects to the Indiana bat are anticipated to occur, and would primarily take the form of harm and harassment. These effects are discussed further below.

Loss of roosting habitat

<u>Indirect effects on the maternity colony</u>

One of the most substantial indirect effects on the Indiana bat from the proposed activities will be the loss of high quality Indiana bat maternity roosting habitat. Approximately 31.55 acres of clearing and grubbing for construction will occur during calendar year 2010. Within the 31.55 acres of clearing, 7.04 acres are wooded, and up to 24 potential roost trees and 5 potential maternity roost trees will be removed. The 7.04 acres and up to 29 roost trees will be

permanently lost and will no longer provide suitable roosting habitat for the individuals of the Indiana bat maternity colony that is assumed to occupy the project site.

When female bats return to their summer maternity area in the spring after tree clearing activities have occurred, it is likely that they will first attempt to use the same roosting areas that were used in previous years because they are philopatric (Kurta and Murray 2002). It is also likely that these pregnant females will suffer stress while searching for new roosting habitat if their traditional roost habitat is lost or degraded. If they are required to search for new roosting habitat in the spring, this effort will place additional stress on pregnant females at a critical time when fat reserves are low or depleted, and they are already stressed from the energy demands of migration and pregnancy.

It appears that when a primary roost tree falls, members of a colony may initially distribute themselves among several previously used alternate roost trees (USFWS 2002; Kurta et al. 2002). It is likely that due to the ephemeral nature of roost trees, the Indiana bat has evolved to be able to locate replacement roosts, if available, when their previously-used roost trees become unsuitable. We assume that one or more primary or alternate maternity roost trees are located within the action area, and assume that one or more of these will be removed to facilitate construction. Considering the relatively restricted footprint of forest impacts (7.04 acres) it is plausible that at least some, and probably most, of the colony's alternate roosts occur outside of the footprint of forest impacts. The availability of potentially suitable roosting habitat in the surrounding landscape (e.g., forested park land to the west connected to the project area by mostly continuous tree lines and fence rows) and the likelihood that many of the colony's alternate roosts will remain standing outside the footprint of tree clearing suggest that individuals of the colony may successfully locate alternate roosts upon returning from their hibernaculum. However, reestablishment of the colony at a primary roost may take several days.

The effects of the loss of traditional roost habitat may be amplified by the poor thermoregulatory abilities of pregnant and lactating females (Studier and O'Farrell 1972 in Humphrey 1975). Pregnant bats not only need to secure sufficient food to maintain their body weight and temperature, they also need to support a growing fetus or pup. In spring, maintaining an energy balance is complicated by the need for pregnant bats to migrate to their traditional roosting areas after completing 6 to 7 months of hibernation, and hence, having depleted or low fat stores during a time when temperatures are low and food is scarce (Kurta and Rice 2002). Consequently, during this period pregnant females are less able to maintain their current energy input and are likely unable to easily increase energy gain (increase food intake) in response to low temperatures. Hence, females face a delicate energy balance through rearing of young. The removal of one or several primary or alternate roosts within the 7.04 acre footprint of tree clearing may cause some females to alter roosting and/or foraging areas somewhat. However, the limited footprint of clearing comprises only a small amount of the average foraging area of a female Indiana bat (Kiser and Elliott 1996, Murray and Kurta 2004), and forested areas and park land are located nearby, west of the clearing footprint, so it is likely that displaced female bats will be able to locate other traditional alternate roosts, although the reproductive output of a few individual females could be impacted. These impacts would result from the extended time needed to locate a suitable maternity roost and could take the form of delayed parturition, pups born with lower birth weights, and/or death of up to two pups.

As previously stated, harassment, a form of take, is defined as 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, and sheltering (50 CFR § 17.3). Therefore, based on the above information, the Service believes that take in the form of harassment due to the disruption of roosting areas for a few individual female bats is reasonably certain to occur.

Indirect effects on male and non-reproductive female bats

In addition to a maternity colony, adult male and non-reproductive female Indiana bats may also be indirectly exposed to loss of roosting habitat in the project area. Effects on these individual bats would be assumed to be less severe than the effects associated with individuals of maternity colonies. Adult male and non-reproductive female Indiana bats are not subject to the physiological demands of pregnancy and rearing young. Males and non-reproductive females typically roost alone or occasionally in small groups. When these individuals are displaced from roosts they must utilize alternative roosts or seek out new roosts. Because these individuals are not functioning as members of maternity colonies, they do not face the challenge of reforming as a colony. Roost tree requirements for non-reproductive Indiana bats are less specific, whereas maternity colonies generally require larger roost trees to accommodate multiple members of a colony. Therefore, it is anticipated that adverse indirect effects to male and non-reproductive female bats will be less than the effects to reproductively active females. The Service anticipates that indirect effects to individual male and non-reproductive female Indiana bats from the loss of roosting habitat will be insignificant or discountable.

Loss of foraging habitat

Another indirect effect of the proposed project on the Indiana bat will be the loss of foraging habitat. There will be 7.04 acres of high quality foraging habitat permanently lost due to implementation of the proposed action.

Indirect effects to the maternity colony

Indiana bats exhibit strong site fidelity to their traditional summer colony areas and foraging habitat, that is, they return to the same summer range annually to bear their young (Kurta et al. 2002; Garner and Gardner 1992; Gardner et al. 1991; Humphrey et al. 1977; Gardner et al. 1996; Cope et al. 1974). Telemetry studies on a maternity colony in Indiana have indicated that Indiana bats continue to return to areas that previously served as foraging habitat, even after those areas have been developed and no longer provide suitable habitat (USFWS 2003).

This information indicates that when the females of the maternity colony in and near the action area return to their summer range, individuals will attempt to use the same foraging areas that were used in previous years. After clearing is completed on the project area, 7.04 acres of high quality foraging habitat will no longer be available due to removal. Furthermore, the relocated section of Byers Road will bisect the stream through the large northern woodlot (Woodlot A), potentially disrupting a travel and/or foraging corridor. The southern, relocated segment of

Byers Road will clear a wooded tree line in which several potential maternity roost trees occur. This tree line may also represent a travel and/or foraging corridor for the bats, which will no longer be available.

In general, Indiana bats are reluctant to cross open areas (Brack 1983; Menzel et al. 2001). Once the project footprint area has been cleared, some Indiana bats whose foraging and commuting areas have been altered may avoid flying across this area. These individuals would be subject to an increase expenditure of energy to establish a new roosting area as well as travel corridors between roosting and foraging. Bats in this scenario would be subject to take in the form of harm or harassment as they are displaced from their home range. ODOT and the MCTID has sought to offset the potential for adverse effects from disruption of travel corridors by planting trees and/or restoring riparian corridors on property owned by the Five Rivers Metro Parks and the City of Miamisburg located on land west of the project site. The Service anticipates that these conservation measures will mitigate potential adverse effects to individual female Indiana bats from loss of foraging habitat by creating future roosting and foraging habitat and enhancing current habitat for the Indiana bat in the local landscape.

The destruction and/or degradation of 1.34 acres of forested wetlands within the 7.04-acre forest footprint will eliminate foraging areas and drinking sources for the Indiana bat. In addition, the Indiana bat's prey base will be reduced due to the loss of insects associated with the 1.34 acres of wetland and 7.04 acres of upland forest in the project footprint.

The effects to individual bats from the loss of foraging habitat are likely to vary based upon each bat's usage of this area. As stated in the Environmental Baseline above, we assume Indiana bats use the project area for roosting, brood rearing, and foraging. It is likely that Indiana bats that only occasionally foraged in the project area would be familiar with other nearby foraging areas and should be able to quickly adjust their foraging habitats by spending more time foraging in other portions of their range. For bats that foraged more extensively within the project area, the effect may be more severe. Due to the small size (7.04 acres) of the forest footprint, it is unlikely that any bats forage in the project area exclusively.

In addition to the Indiana bat, the Service assumes that other species of bats (e.g., little brown bat, eastern pipistrelle, big brown bat) are present in the project area. Therefore, the potential for the project to increase inter- and intra-specific competition during foraging must also be considered. Although very little literature is available to assess the impact of this effect, interspecific competition has been identified as an area of concern by researchers monitoring maternity colonies subject to habitat alterations in Indiana (USFWS 2003). Feeding habits for Indiana bats are similar to those of the little brown bat, the northern long-eared bat, and to a lesser extent the eastern pipistrelle (Whitaker 2004). Therefore, competition between those species could occur as all species within the 7.04-acre forest footprint could potentially be displaced and forced to move quickly into other foraging habitat. However, the effects to individual bats from the loss of foraging habitat and increased competition may be somewhat offset by the availability of suitable foraging habitat in the surrounding landscape and the likelihood that most bats, regardless of species, do not forage exclusively or extensively in the 7.04-acre wooded area to be cleared.

It is also important to consider the potential effects to reproductively active females in concert with other life history and environmental factors. Indiana bats that are already subject to energy demands of hibernation, migration, and pregnancy may be displaced from their foraging ranges. They will then have to expend energy to search for new areas to forage while at the same time being subject to an increase in competition for prey. In addition, environmental factors, such as an unseasonably cool spring, could limit the availability of prey while at the same time increasing the energetic cost of thermoregulation. When combined, these factors could reduce the fitness of pregnant Indiana bats to the extent that some may not successfully bear a pup and/or some pups may be born with lower birth weights, such that they may have delayed development. However, due to the limited footprint of tree clearing and the likelihood that the 7.04-acres to be cleared is only a small part of the traditional foraging range of a female bat, individual Indiana bats may have little difficulty successfully locating and establishing modified or new foraging areas and adverse effects from competition may not be detectable.

Indiana bats that remain loyal to foraging areas and/or travel corridors may continue to cross the project area following the clearing activities. These Indiana bats would be subject to an increased risk of predation because they would be more visible to predators. Yet, there is no way to meaningfully measure this increased predation risk. If any predation of Indiana bats occurs indirectly as a result of the project, it is not likely to be detected.

Overall, the effect of the loss of 7.04 acres of high quality foraging habitat on individual bats from the maternity colony will range from insignificant and discountable effects to take in the form of harm and harassment. Due to the small footprint of the project, the foraging areas for many of the bats would likely be entirely or mostly outside the project footprint. The effects to these individuals are anticipated to be minimal. Individual bats that may use the 31.55-acre footprint for foraging may have to expend an increased amount of energy to establish new foraging areas, thereby further reducing their fitness for successful reproduction. Additionally, the effects of individual bats will differ depending upon variable factors such as the weather and the condition of individuals upon emergence from hibernation.

Indirect effects on male and non-reproductive female bats

As predicted with the maternity colony, most males and non-reproductive females are likely utilizing foraging areas that lie entirely or mostly outside the tree clearing footprint due to the small footprint of the forest impacts. Effects to these individuals are anticipated to be minimal, although they may be forced to find new foraging areas or forage more heavily in other portions of their established foraging range. However, these effects would not be complicated with the energy demands of pregnancy and rearing of pups, and therefore are anticipated to be minimal.

Individuals seeking modified or new foraging areas will be subject to an increase in inter- and intra-specific competition. As with the reproductive females, the effects to individual male and non-reproductive female bats from the loss of foraging habitat and increased competition may be somewhat offset by the availability of suitable foraging habitat in the surrounding landscape.

In general, Indiana bats are reluctant to cross open areas (Brack 1983; Menzel et al. 2001). Once the project footprint area has been cleared, some Indiana bats whose foraging and commuting

areas have been altered may avoid flying across this area. These individuals would be subject to an increase expenditure of energy to establish a new roosting area as well as travel corridors between roosting and foraging. Bats in this scenario would be subject to take in the form of harm or harassment as they are displaced from their home range. ODOT has sought to offset the potential for adverse effects from disruption of travel corridors by planting trees and/or restoring riparian corridors on property owned by the Five Rivers Metro Parks located on land west of the project site. The Service anticipates that these conservation measures will minimize potential adverse effects to individual male and non-reproductive female Indiana bats from loss of foraging habitat by creating future roosting and foraging habitat and enhancing current habitat for the Indiana bat in the local landscape.

Due to the availability of suitable roosting and foraging opportunities in the surrounding landscape, it is likely that displaced male and non-reproductive female bats will have little difficulty in establishing new home ranges within a few days of returning to their summer areas. Under this scenario, take of male and non-reproductive female bats is anticipated to be short term in the form of harassment. The effect on pregnant bats is likely to be more severe (as discussed previously). Indiana bats that remain loyal to foraging areas and/or travel corridors may continue to cross the project area following the clearing activities. These Indiana bats would be subject to an increased risk of predation because they would be more visible to predators. Yet, there is no way to meaningfully measure this increased predation risk. If any predation of Indiana bats occurs indirectly as a result of the project, it is not likely to be detected.

Indirect effects of decreased water quality

The Service believes that the loss of 1.34 acres of wetlands within the 31.55-acre footprint will cause a reduction in the aquatic insect prey base and drinking sources for the Indiana bat within the 31.55-acre footprint. ODOT and the MCTID propose to implement BMPs to avoid and minimize any potential impacts to adjacent wetlands outside of the 31.55-acre footprint due to sedimentation and runoff. Indirect adverse affects to Indiana bats from this decrease in aquatic insect prey and drinking sources is likely to be undetectable due to the small footprint of the project combined with the availability of suitable habitat in the surrounding landscape and the assumption that bats will use or seek alternate areas for foraging and drinking as some areas become unsuitable. The Service presumes that the surrounding landscape will continue to provide an abundant prey base of both terrestrial and aquatic insects during project construction, operation and maintenance. Therefore, any potential indirect adverse affects to Indiana bats from a reduction in water quality is anticipated to be insignificant and/or discountable.

Summary of Effects

The Service anticipates that Indiana bats will incur indirect effects from the proposed Byers Road project. The intensity of effects will differ by activity, season, and condition and home range of individual bats. Indirect effects to Indiana bats are anticipated from the removal of habitat and due to noise disturbance.

Direct take (killing or injuring) of Indiana bats will be avoided due to project specifications that avoid cutting of potential roost trees between April 1 and September 30, when bats are most

likely to occur within the action area. There are no known hibernacula in the action area; therefore, no effects on hibernating Indiana bats are anticipated.

Indirect effects on Indiana bats are anticipated from the project due to the loss and fragmentation of roosting and foraging habitat and disturbance from construction related noise. Some bats will be subject to take in the form of harm or harassment due to displacement from traditional roosts and foraging areas that are cleared. The effect upon individuals of the maternity colony would likely be more severe than the effect upon males and non-reproductive females since pregnant females may be forced to alter their home ranges in the spring when they return to the area at a time when they are already stressed from the physical demands of pregnancy in addition to the decreased fitness following hibernation and migration. Noise associated with construction activities is anticipated to temporarily reduce the suitability of roosting habitat in portions of the action area. Take due to indirect effects is anticipated to range from insignificant and discountable effects to take in the form of harm and harassment, and will differ depending upon the home range and condition of individual bats as well as the tolerance of individual bats to noise disturbance.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Service is not aware of any specific State, tribal, local or private actions likely to occur in the action area which would affect Indiana bats.

Conclusion

After reviewing the current status of the Indiana bat, the environmental baseline for the action area, the effects of the proposed Byers Road relocation project, and the cumulative effects, it is the Service's biological opinion that the construction and operation of the relocated Byers Road, as proposed, is not likely to jeopardize the continued existence of the Indiana bat, and is not likely to destroy or adversely modify designated critical habitat. Critical habitat for this species has been designated at hibernacula in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia; however, this action does not affect these areas. Therefore, no destruction or adverse modification of that critical habitat is anticipated.

Based on the past rates of decline, the expected continued rate of decline, and lack of knowledge of the causes of the decline, it is reasonable to conclude that the species' survival is in serious question. As explained earlier, Indiana bats continue to decline. Although their absolute numbers are seemingly high, the Indiana bat life history strategy renders this species especially susceptible to population declines. As a result of these past and anticipated continued declines, the Indiana bat is increasingly highly endangered. Improving the reproductive success of Indiana bats is paramount for their continued survival. Maternity colonies represent an important population structure that is crucial to the survival of the Indiana bat.

In order to slow down and reverse the rate of decline, and get to survival and recovery, the Indiana bat not only needs to maintain its current rate of reproduction, but also increase its reproduction and decrease its mortality rates. Nevertheless, based on the Service's analysis of effects, it does not appear that the proposed action will significantly affect reproduction of Indiana bats or increase the species' vulnerability of extinction.

The Service concludes that overall the project will not contribute to a measurable decrease in reproduction or numbers of the Indiana bat. The Service also determined that the loss of 7.04 acres of high quality roosting and foraging habitat, the fragmentation of the suitable habitat on the 31.55-acre property for the proposed Byers Road relocation, and the loss of 1.34 acres of wetlands is not likely to result in an appreciable reduction to the distribution of the species given the availability of the remaining suitable habitat in the surrounding landscape and ODOT and the MCTID's commitment to restore and enhance habitat in the local area through its partnership with the Five Rivers Metro Park.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by 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 ODOT and the MCTID for the exemption in section 7(o)(2) to apply. ODOT and the MCTID have a continuing duty to regulate the activity covered by this incidental take statement. If ODOT and the MCTID fail 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, ODOT and the MCTID must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [150 CFR §402.14(i)(3)].

Amount or Extent of Take Anticipated

Based on the proposed project as describe within and the conservation measures provided , we anticipate that incidental take of Indiana bats will occur in the form of harm or harassment through habitat loss.

Based on our analysis of the environmental baseline and effects of the proposed action, the Service anticipates that one maternity colony of Indiana bats and male and non-reproductive female Indiana bats sporadically occupy the action area in small numbers and may be impacted as a result of the proposed project. Collectively, the effects of the action are expected to result in behavioral or physiological effects which impair essential behavioral patterns. Decreased fitness of a few individuals is reasonably certain to occur. Specifically, we anticipate that up to five (5) individual females will experience the following reproductive impacts: delayed parturition, pups born with lower birth weights, and/or death of up to two (2) pups.

Construction and operation of the Byers Road realignment is expected to result in the permanent loss of 7.04 acres of high quality roosting and foraging habitat and the fragmentation of the suitable habitat on the 31.55-acre property.

The Service anticipates that incidental take of Indiana bats will be difficult to detect for the following reasons: the species is highly mobile; the species occurs in habitat (e.g., trees) that makes detection difficult; and finding dead or moribund bats is unlikely due to a small body size and the likely scavenging of specimens by predators. However, the following level of take of this species can be anticipated by (1) the loss of 7.04 acres of high quality roosting and foraging habitat, including 1.34 acres of wetlands, for project construction and operation, and (2) the fragmentation of suitable habitat on the 31.55-acre property. We expect that no more than two (2) individual fetal bats/pups bats will die as a result of the proposed action, resulting in a small decrease in the reproductive output of the colony.

Effect of the incidental take

In the accompanying biological opinion, the Service determined that, based on the proposed project and the conservation measures described within, this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and prudent measures

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

1. The implementation status of all the proposed conservation measures, mitigation efforts, and terms and conditions will be monitored and clearly communicated to the Service on an annual basis.
2. To the maximum extent practicable, incorporate measures to benefit the Indiana bat into mitigation plans for wetland impacts.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, ODOT and the MCTID must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. Monitoring Requirements:

A. ODOT and the MCTID will prepare an annual report detailing all conservation measures, mitigation efforts, and terms and conditions 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 Ohio Field Office (OHFO) by 31 January each year (the first report will be due January 31, 2010) and reporting will continue until the construction phase of the project is completed.

B. Any dead bats located within the construction limits, regardless of species, should be immediately reported to OHFO [(614) 416-8993], and subsequently transported (frozen or on ice) to OHFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to OHFO. OHFO will make a species determination on any dead or moribund bats.

2. During the development of wetland mitigation plans required under the Clean Water Act, ODOT and the MCTID will seek mitigation opportunities which will fulfill the requirements of the Act and benefit the Indiana bat through habitat protection, restoration and/or enhancement.

In conclusion, the Service believes that the Byers Road project will result in 1) the permanent loss of 7.04 acres of high quality Indiana bat maternity, roosting and foraging habitat; 2) the deaths of up to two fetal bats/pups; and 3) the permanent fragmentation of 31.55-acres of suitable habitat. Temporary disturbances due to construction noise are anticipated within 3200 feet of the property boundary. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. ODOT and FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Develop and implement a statewide initiative to help control and prevent the spread of non-native invasive plant species by construction and maintenance equipment.

In order for the Service to be kept informed of actions 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 ODOT and the MCTID on the construction and operation of the proposed Byers Road realignment in Montgomery County, Ohio. 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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