

# **BIOLOGICAL OPINION**

On the

**Ohio Department of Transportation's  
Statewide Transportation Program**

For the

**Federally-listed endangered Indiana bat (*Myotis sodalis*)**



**Submitted to the Federal Highway Administration**

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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 Ohio Department of Transportation's (ODOT) Statewide Transportation Program, and its effects on the Indiana bat (*Myotis sodalis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). On September 7, 2006, the Service received the Federal Highway Administration's (FHWA) request for formal consultation along with the Programmatic Biological Assessment for the Indiana Bat for the implementation of ODOT's Statewide Transportation Program (BA). The Service determined that the initiation package received on September 7, 2006 was complete in accordance with 50 CFR §402.14 and provided a letter to FHWA stating that the Service had received a complete initiation. Formal consultation was initiated on September 7, 2006.

This Biological Opinion is based on information provided in the BA, meetings, telephone conversations, and e-mail exchanges among the Service, FHWA, and ODOT, and other sources of information. A complete administrative record of this consultation is on file at the Service's Reynoldsburg, Ohio Field Office (ROFO).

## CONSULTATION HISTORY

Table 1 presents a summary of the primary points in the consultation history.

**Table 1.** Summary of consultation history for the programmatic

<b>DATE</b>	<b>EVENT/ACTION</b>
October 29, 2002	ODOT, FHWA, ODNR, and the Service meet to discuss coordination procedures for standard highway projects.
July 30, 2003	ODOT, FHWA, ODNR, and the Service sign MOA describing consultation procedure for standard highway projects.
April 2004	Through a 3 day partnering session, between ODOT, FHWA, and the Service, an agreement was signed that a statewide programmatic consultation (PC) was needed for the Indiana bat in order to streamline interagency efforts to protect the species.
May 5, 2004	Letter of Agreement signed between ODOT, FHWA, and the Service stating that if suitable habitat for the Indiana bat is present in a project area, ODOT will consult with the Service as it has been, until the programmatic consultation is completed and streamlines the procedure.
July 1, 2004	Two year position in the Service, funded by ODOT, begins in order to address details of a PC for the Indiana bat. Two separate contracts funded by ODOT in order to compile background information and GIS location information on the Indiana bat in Ohio for use in the programmatic consultation.
December 3, 2004	The effects of proposed actions on listed species, including the Indiana bat, have been addressed by informal consultation with the Service on a project-by-project basis, until ODOT and FHWA initiate first formal consultation.

March 10, 2005	Background information and GIS location information compilation is completed, creating two databases, by contractors with the help of the ODOT funded Service person.
May 2005	The Service receives GIS layer of all ODOT projects thought to be included in the PC, so baseline work can begin.
December 2005	ODOT, FHWA, and the Service are provided with review copies of first draft of this PC.
April 2006 - present	Test run of terms in PC is implemented on MOA projects, use draft PC for consultation.
July 21, 2006	ODOT and USFWS staff conduct site visit/field training day in order to view real world examples of definitions in PC (roost trees, corridors, etc.).
September 7, 2006	The Service receives a letter and initiation package from FHWA requesting initiation of formal consultation.
September 8, 2006	The Service sends letter to FHWA notifying that a complete initiation package was received and formal consultation was initiated on 9/7/06.
December 12, 2006	The Service requests and receives clarification on proposed action via email
January 4, 2007	The Service emails draft BO to FHWA and ODOT for review and comment.
January 16, 2007	The Service receives written comments on the draft BO from ODOT
January 17, 2007	The Service received written response on draft BO from FHWA
January 18, 2007	The Service and FHWA coordinate via phone to discuss ODOT comments
January 19, 2007	The Service and ODOT coordinate via phone to discuss and clarify ODOT comments
January 26, 2007	The Service issues the final BO to FHWA and ODOT

In their request for formal consultation received by the Service on September 7, 2006, FHWA determined that 1) certain activities carried out under ODOT's Statewide Transportation Program are likely to adversely affect the Indiana bat (*Myotis sodalis*), and 2) removal of potential Indiana bat roost trees  $\leq$  8 inch diameter at breast height (dbh) statewide is not likely to adversely affect the Indiana bat. FHWA requested our concurrence with these effect determinations.

In a letter dated September 8, 2006, we concurred with FHWA's determinations that 1) the overall implementation of ODOT's Statewide Transportation Program project is likely to adversely affect the Indiana bat, 2) the removal of potential Indiana bat roost trees  $\leq$  8 inch diameter at breast height (dbh) statewide is not likely to adversely affect the Indiana bat, and 3) indicated that the initiation package associated with the request for formal consultation was complete in accordance with 50 CFR §402.14.

The Service concurred with FHWA's effect determination of "not likely to adversely affect" for removal of potential roost trees  $\leq$ 8 inch dbh based on the following rationale: although in some cases single or few Indiana bats have been found roosting in trees with smaller diameters than 8

inch dbh, they are considered rare, i.e., not the norm for the species (Kurta 2005). In addition, high quality habitat is rarely found within rights-of-way of roads. Existing rights-of-way, if forested, typically contain lower quality habitat because they have been subject to previous disturbances through clearing, construction, maintenance, and operation activities. Because Indiana bats rarely roost in trees with diameters  $\leq 8$  inches and ODOT projects typically occur within existing rights-of-way, the likelihood that an Indiana bat would be roosting within a tree  $\leq 8$  inches dbh within a right-of-way is extremely small and thus, discountable.

Consultation on the removal of potential roost trees  $\leq 8$  inch dbh was concluded on September 8, 2006. This activity will not be considered further in this Biological Opinion. Should, during the term of this action, additional information on the Indiana bat becomes available, or if new information reveals effects of the action that were not previously considered, FHWA should consult with the Service to determine whether these determinations are still valid.

The Service will implement a tiered programmatic consultation approach to ODOT's Statewide Transportation Program. Tier I analyzes the program as a whole for impacts to the Indiana bat. No specific projects are analyzed at this level. As individual projects are proposed under the program, ODOT will provide the Service with project-specific information that includes:

- 1) A description of the proposed action and the area to be affected including latitude and longitude information,
- 2) A completed Indiana bat Ohio Habitat Assessment Form (OHAF) and determination of effects.
- 3) The amount of incidental take anticipated for the project,
- 4) A cumulative total of incidental take that has occurred to date under the programmatic biological opinion (This will be delegated to the ODOT funded USFWS Transportation Liaison in the Reynoldsburg, Ohio Field Office. Should ODOT choose to discontinue funding of this position, responsibility of tracking take will revert back to ODOT),
- 5) A description of all conservation and mitigation measures to be implemented.
- 6) A description of any additional actions or effects, if any, not considered in the tier I consultation.

The Service will review the information provided by ODOT for each proposed project. During the review if it is determined that an individual project is not likely to adversely affect listed species, the Service will complete its documentation with a concurrence letter that refers to the programmatic biological opinion and specifies that the Service concurs that the project is not likely to adversely affect listed species. If it is determined that a project is likely to adversely affect listed species, the Service and ODOT will engage in formal consultation for the project. Formal consultation culminates with the Service providing a tier II biological opinion with a project-specific incidental take statement if take is reasonably certain to occur.

## GLOSSARY

For the purposes of this programmatic consultation (PC), the following frequently used terms are provided below.

**Foraging Areas** - Areas that have a food supply (insects) for adult Indiana bats and their young and may serve as night roosts for resting and digesting meals. These areas may be within or on the edge of forested areas, with an open subcanopy providing the best foraging habitat. Foraging areas occur along streams, in floodplain forests, in and around forested wetlands and impoundments. Streams are apparently not used if riparian trees have been removed.

**Roost Tree** – Trees that may support roosting bats. Roost trees have the following habitat characteristics: Live or standing dead trees or snags over 8” diameter at breast height (dbh) with exfoliating, peeling or loose bark, split trunks and/or branches, or cavities. If the tree characteristics are only found on the branches of the tree, the branches must be over 6” diameter at the site of the peeling bark, split in the branch, or cavity, etc.

**Maternity Roost Tree** - Trees that may support maternity colonies (reproductive females and their young that may number 100 individuals or more). Maternity roost trees have the following habitat characteristics: Live or standing dead trees or snags over 16” diameter at breast height (dbh) with exfoliating, peeling or loose bark, split trunks and/or branches, or cavities.

These characteristics must be plentiful enough to allow the colony to change locations along the tree to aid in thermoregulation. If the habitat characteristics are found only on the branches of the tree, the branches must be at least 8” in diameter at the site of the habitat characteristics. These trees must have some solar exposure and must be within sight distance of at least one other potential maternity roost tree. These trees must be part of (forested area or within a fence row of trees at least two trees wide) or connected to a travel corridor or larger forested area.

**Solar exposure** - Solar exposure is direct sunlight to the trunk or branches where suitable roosting habitat is found for all or part of the day. Maternity roosting trees require some solar exposure to provide thermoregulation to the young. This solar exposure can come from the tree being at the edge of a forested tract or because the tree is a super canopy tree (much taller than the trees around it).

**Travel Corridor** - A contiguous linear wooded corridor at least two trees wide that connects roosting and foraging areas, and may be used during migration. These corridors may be riparian areas along streams, wooded fence rows, small wooded roads and paths, open-understory forest, or wooded residential areas.

**Hibernaculum** - Area where bats hibernate during the winter. Hibernacula are typically caves, or abandoned mines that provide cool, humid, stable conditions for hibernation.

## BIOLOGICAL OPINION

## **I. DESCRIPTION OF THE PROPOSED ACTION**

The proposed action is the continuing implementation of ODOT's Statewide Transportation Program, in cooperation with FHWA. The action includes current and future projects over a five-year period (January 2007 through January 2012). These projects would include all forms of road construction and maintenance. It is not guaranteed that all ODOT projects that are scheduled today will be completed, therefore there is no way to know the details of every project that will be completed through January 2012; the project schedules change daily in ODOT's database. Any one project may also change in focus and purpose over time, thereby changing the impacts and/or footprint of the project. Because of this lack of certainty, a snapshot of scheduled projects was extracted from the ODOT database in 2005, to give an overall estimation of the number and type of projects that may occur over a five year period. Major new projects (on new alignments) will likely have effects that fall outside of the scope of this consultation, and therefore will be consulted on individually as they arise, although measures from this Programmatic Consultation can be used to minimize impacts for any such projects.

ODOT construction and maintenance projects typically include several activities that may require the removal of trees from the landscape. These trees may be located on existing roadway rights-of-way or newly acquired rights-of way. Projects can vary greatly in the level of disturbance they may cause, and range from the removal of no to few trees (as in the case of a simple culvert replacement) to the removal of acres of wooded habitats (as in the case of construction of a major roadway on new location). The types of activities conducted by ODOT that may result in the removal of trees may include:

- Drainage improvement projects such as roadway ditch cleanouts and maintenance;
- General roadway safety maintenance (such as removing dead or dying trees that may be overhanging the roadway);
- Construction of sidewalks;
- Construction or replacement of right-of-way fence;
- Construction of noise walls;
- Construction of bike lanes on existing roadways, on new alignments, or along abandoned railroads or canal towpaths;
- Constructing overpasses or underpasses;
- Culvert construction, replacement, or repair;
- Bridge construction, replacement, or repair;
- Widening of existing lanes along roadways;
- Adding new lanes along existing roadways within existing right-of-way;
- Adding turn lanes along existing roadways;
- Repair of landslides or unstable slopes along a roadway;
- Realigning existing roadways, intersections, or interchanges;
- Constructing rest areas, outposts, or other facilities;
- Constructing new interchanges;
- Adding new lanes along existing roadways on new right-of-way; and
- Constructing new roadways on new alignments.



In general, these activities have been ranked in order of their potential impacts to forested habitats (which Indiana bats depend upon); however, the degree of impacts that these projects may have could vary greatly based on the surrounding land cover/use, terrain, and extent of the project area (length of roadway, size of bridge, etc.). For example, the construction of a new four lane, divided, limited access highway in northwest Ohio may result in disturbances to an approximately 300 foot wide alignment on relatively flat, previously farmed lands, possessing few trees. However, a similar type of roadway constructed in a hilly, forested area of southeast Ohio, could possibly require a variable alignment width due to the terrain (possibly ranging from 300 to 1,000 feet), and may result in a much greater number of forest habitat impacts.

The site specific variability inherently associated with each individual project makes it very difficult to predict the disturbance area associated with each work activity. In terms of project width, maintenance, rehabilitation, replacement, and minor widening activities would generally remain within 50 feet of the existing right-of-way (for example, heavy equipment would remain within 50 feet upstream or downstream of a bridge being replaced). Smaller (less than 4 lane) new alignment projects (new roads or relocations) would generally disturb an area less than 150 feet wide, while larger (four lanes or greater) new alignment projects would generally disturb an area less than 500 feet in width. While extremely variable due to terrain and other constraints, new interchange projects would generally disturb an area less than 2,000 feet in diameter. In each of these examples, the area of disturbance may be less than, or exceed, the predicted value based on project specific conditions, and would vary greatly based on the proposed length of the project.

Ohio is approximately 28,701,440 acres, of which, land is about 25,900,160 acres and water and wetlands are about 2,801,280 acres (Sanders and Zimmerman 2000). The State is 30% forested today, and 96% of these forests are comprised of deciduous trees (ODNR 2006). Forests in Ohio today are highly fragmented, as seen by viewing the Ohio Land Cover Data Set created by the U.S. Geological Survey (USGS). Ohio's largest section of forest is the only National Forest in the State, the Wayne National Forest (WNF). The WNF itself is fragmented by private and State lands, and is divided into three physically separated units which total approximately 238,000 acres (USFS 2006). There are over 4,000 different streams in Ohio that together create a network of an estimated 61,532 total miles of water (Sanders and Zimmerman 2000).

For purposes of this PC, Ohio has been split into 5 Management Units (Figure 1). The Management Units were chosen by taking into account differing land use, vegetative land cover, and Indiana bat survey data (and thus, known suitable habitat) across the State. Major factors in choosing the boundaries for each unit are as follows:

**West Unit:** Majority of agricultural lands in Ohio, small, isolated wood lots (forested patches), largest hibernaculum, evidence of maternity colonies. Counties included are: Allen, Auglaize, Champaign, Clark, Darke, Defiance, Erie, Fulton, Greene, Hancock, Hardin, Henry, Huron, Logan, Lucas, Mercer, Miami, Montgomery, Ottawa, Paulding, Preble, Putnam, Sandusky, Seneca, Shelby, Van Wert, Williams, Wood, and Wyandot.

**Central Unit:** Transitional land cover between primarily agricultural in the West to more heavily forested in the East, evidence of maternity colonies. Counties included are: Crawford,

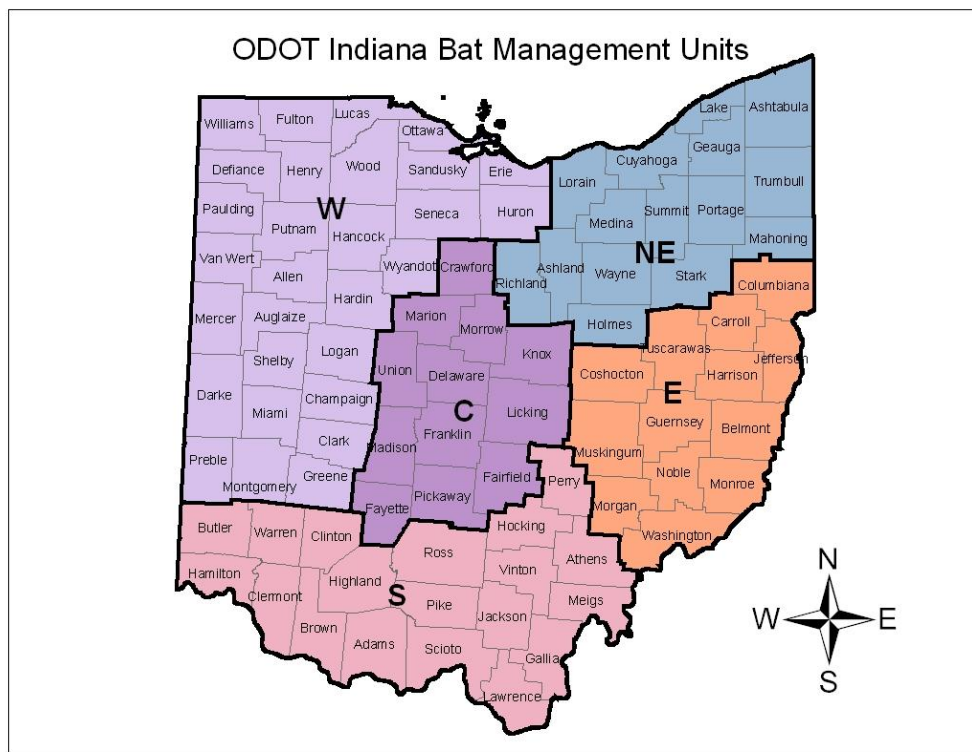
Delaware, Fairfield, Fayette, Franklin, Knox, Licking, Madison, Marion, Morrow, Pickaway, and Union.

**Northeast Unit:** Forested, heavy in wetlands and woody wetlands, evidence of maternity colonies and hibernacula, some coal mining activity (and associated negative surveys). Counties included are: Ashland, Ashtabula, Cuyahoga, Geauga, Holmes, Lake, Lorain, Mahoning, Medina, Portage, Richland, Stark, Summit, Trumbull, and Wayne.

**East Unit:** Forested, one of the three National Forest Ranger Districts occurs in the East Unit, heavy coal mining activity (and associated negative surveys), no capture records to date. Counties included are: Belmont, Carroll, Columbiana, Coshocton, Guernsey, Harrison, Jefferson, Monroe, Morgan, Muskingum, Noble, Tuscarawas, and Washington.

**South Unit:** Most heavily forested section of Ohio, two of the three National Forest Ranger Districts occur in South, evidence of maternity colonies and hibernacula. Counties included are: Adams, Athens, Brown, Butler, Clermont, Clinton, Gallia, Hamilton, Highland, Hocking, Jackson, Lawrence, Meigs, Perry, Pike, Ross, Scioto, Vinton, and Warren.

**Figure 1.** Management Units



W = West Management Unit  
 C = Central Management Unit  
 NE = Northeast Management Unit  
 S = South Management Unit  
 E = East Management Unit

For the purposes of this programmatic consultation, ODOT has separated their Statewide Transportation Program activities into 3 categories.

**Programmatic Category 1** - This category includes the following activities:

**PC1-a.** Projects in the South, East, and Northeast Indiana bat Management Units that:

- will remove 20 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum; and
- are not within 5 miles from an Indiana bat capture record.

**PC1-b.** Projects in the West and Central Management Units that:

- will remove 10 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum;
- are not within 5 miles of an Indiana bat capture record; and
- occur in forested patches (or are connected to forested patches via a tree line) that are smaller than 100 acres in size, or that are 100 acres or more in size but there is no perennial water source within 0.5 mile of potential roost trees.

**Programmatic Category 2** - All projects in this category will include seasonal tree cutting (after September 15 and before April 15) and will not remove potential maternity roost trees, but may remove isolated potential maternity roost trees. This category also includes the following activities:

**PC2-a.** Projects in the West and Central Indiana bat Management Units that:

- will remove 10 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum;
- occur within a forested patch (or are connected to a forested patch) that is 100 acres or more in size, where a perennial water source is found within 0.5 mile of potential roost trees; and
- are not within 5 miles of an Indiana bat capture record.

**PC2-b.** Projects in the South, East, and Northeast Management Units that:

- will remove 20 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum; and
- are within 5 miles of an Indiana bat capture record.

**PC2-c.** Projects in the Central Management Unit that:

- will remove 10 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum; and

- are within 5 miles of an Indiana bat capture record.

**PC2-d.** Projects in the West Management Unit that:

- will remove 10 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum;
- are within 5 miles of an Indiana bat capture record;
- will not remove any potential Indiana bat travel corridor; and
- occur in a forested patch (or are connected to a forested patch) that is smaller than 100 acres in size, or that is 100 acres or more in size where the project will remove 10% or less of the forest patch.

**PC2-e.** Projects in all Units that:

- will not remove potential maternity roost trees;
- are within 10 miles of a known or suspected Indiana bat hibernaculum; and
- will remove any trees within riparian corridors.

**Programmatic Category 3** - This category includes the following activities:

**PC3-a.** Projects in the West Management Unit that:

- will remove 10 or fewer potential roost trees;
- will not remove potential maternity roost trees;
- are farther than 0.5 mile from a known or suspected Indiana bat hibernaculum;
- are within 5 miles of an Indiana bat capture record;
- occur in a forested patch (or are connected to a forested patch) that is smaller than 100 acres in size, where the project will remove a potential Indiana bat travel corridor, or that is 100 acres or more in size, where the project will remove more than 10% of forest patch and/or will remove a potential Indiana bat travel corridor.

**PC3-b.** Projects in the West and Central Management Units that will remove more than 10 potential roost trees.

**PC3-c.** Projects in the South, East, and Northeast Management Units that will remove more than 20 potential roost trees.

**PC3-d.** Projects that remove one or more potential maternity roost trees that are not isolated.

**PC3-e.** Projects that remove potential roost trees and/or any trees in riparian areas that are within 5 miles of a known or suspected hibernaculum.

**PC3-f.** Projects that will involve blasting during construction that occur within 0.5 mile of a known or suspected hibernaculum.

To minimize the potential effects to the Indiana bat, one or more of the following alternative measures will be incorporated into any project design that ODOT determines 'May Affect and is Likely to Adversely Affect' the Indiana Bat. ODOT will use the Ohio Habitat Assessment Form (OHAF – Appendix A) to determine which conservation measures to incorporate into a particular project. ODOT will submit to the Service individual projects with site specific activities and Indiana bat conservation measures to be implemented.

- A-1.** To avoid direct take of bats, potential roost trees will be cleared only between 15 September and 15 April.
- A-2.** To avoid direct take of bats when they are foraging (just before and after hibernation) near a hibernaculum, potential roost trees and any trees in riparian areas (exclusive of areas directly adjacent to existing roadways or bridges) will be cleared only between 15 November and 15 March (when bats would be hibernating) within 5 miles of the hibernaculum, and between 15 September and 15 April within 10 miles of the hibernaculum.
- A-3.** Blasting or other loud road work that will cause vibrations will only be performed 15 April to 15 September within 0.5 mile of a hibernaculum, when large numbers of bats would not be in the hibernaculum.
- A-4.** Mist-net surveys will be performed to determine presence in project area in West and Central Management Units.

ODOT estimates that it will not be possible to adhere to the seasonal restrictions on tree removal activities for up to 5 projects per year (ODOT, December 12, 2006 email). However, ODOT will adhere to the following measures:

- ODOT will not remove any non-isolated potential maternity roost trees between April 15 and September 15, unless an emergence survey was performed and did not detect emergence of any bats and/or a mist-net survey was performed and no Indiana bats were captured.
- ODOT will not conduct tree removal activities within 5 miles of a known or suspected hibernacula between March 15 and November 15.
- ODOT will not conduct blasting or other loud road work within 0.5 miles of a hibernacula that will cause vibrations between September 15 and April 15

To minimize the potential effects to the Indiana bat, one or more of the following alternative mitigation measures will be incorporated into any project design that ODOT determines will 'May Affect and is Likely to Adversely Affect' the Indiana Bat. The OHAF will be used to determine which conservation measures will be chosen and a copy will be submitted to the Service for coordination with the Tier 2 consultation letter.

- M-1.** Protection of land/habitat through conservation easement or deed restriction to offset loss of suitable habitat.

- M-2.** Protection/restoration of riparian areas where Indiana bat forages (close to known capture) to offset loss of prey base and/or loss of foraging area.
- M-3.** Protection/restoration of forested wetlands where Indiana bat forages (close to known capture) to offset loss of prey base and/or loss of foraging area.
- M-4.** Tree planting to create future suitable habitat, create future travel corridors, and restore connectivity of forested areas.
- M-5.** Invasive species plant control (i.e. clear understory of bush honeysuckle) to create better quality suitable habitat.
- M-6.** Conduct mist-net surveys (research bank) on public/protected land in West and Central Management Units to refine knowledge of suitable habitat areas.

ODOT will conduct the mitigation measures listed above within the Management Unit where a particular project occurs, as practicable. Mitigation may be conducted in adjacent Management Unit if the project is near or crosses Management Unit boundaries. Below, the mitigation measures have been listed for each Unit in order from highest to lowest priority within individual Units.

**West Unit** –

- M-6, research bank, monitor previous records
- M-2, reforest stream corridors
- M-1, protection of land/habitat
- M-4, tree planting
- M-5, invasive species plant control (i.e. bush honeysuckle)

**Central Unit** –

- M-2 and M-4, if less than 100 acres of total forested land (connected to project), reforest stream corridors
- M-6, if 100 acres or more of total forested land (connected to project), survey, research bank, monitor previous records
- M-1, protection of land/habitat
- M-5, invasive species plant control (i.e. bush honeysuckle)

**South Unit** –

- M-2 and M-4, reforest stream corridors (except Monday Creek)
- M-1, protection of land/habitat
- M-5, invasive species plant control (i.e. bush honeysuckle in southwestern counties)

**East Unit** –

- M-2 and M-4, reforest stream corridors
- M-1, protection of land/habitat

### **Northeast Unit –**

- M-2, conservation easement, deed restriction or place in protected hands areas that are adjacent to other protected areas and protect/restore riparian areas and suitable habitat (acre to acre, priorities below)
  1. forested stream corridors that are connected to protected areas
  2. forested stream corridors
  3. forested patches adjacent to protected areas
  4. forested patches
  5. stream restoration and tree planting
- M-3, protection of wetland foraging area
- M-1, protection of land/habitat

When possible, ODOT is proposing to implement the following additional discretionary conservation measures to further conservation and recovery of the Indiana bat

- Develop education (video, pamphlet) focusing on the Indiana bat for road construction crews, public
- Research by Management Unit
- Protection/restoration of riparian areas where Indiana bat may forage
- Protection/restoration of forested wetlands where Indiana bat may forage
- Native tree planting
- Invasive species plant control

### **Action Area**

The action area includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area is defined by measurable or detectable changes in land, air, and water. The action area is not limited to the “footprint” of the action and should consider the biotic, chemical, and physical impacts to the environment resulting from the action.

ODOT’s work encompasses the entire State of Ohio’s highway system. There are more than 121,000 linear miles of roads throughout the State, with many cities, counties, and parks maintaining their own roads. ODOT is responsible for road construction and maintenance on more than 17,000 linear miles of these roads throughout Ohio (McQuirt, ODOT, pers. comm.). The limited design detail (i.e., the unknown location of detour routes and staging areas) resulted in the action area being defined as the entire State of Ohio as biotic, chemical, physical impacts could occur anywhere within the State of Ohio.

## **II. STATUS OF THE SPECIES**

The Indiana bat was listed as an endangered species in 1967 when the population was estimated to be at 883,300 bats. Rangewide estimates of the Indiana bat have been calculated since 1965. Over the long term from 1965 to 2001, there has been an overall decline in Indiana bat numbers. The rangewide population estimates over the three most recent biennial survey periods do not show the same declining trend seen previously. There was approximately a 16-percent increase

from the 2003 estimate of 393,000 bats to the 2005 rounded estimate of 457,000 bats (USFWS, unpublished data, 2006). Unfortunately, our interpretation of this apparent increase in confounded at this point because we have yet to develop and implement a standardized approach of measuring and reducing sources of variability and observer error. In spite of some changes in methodology over time and a general lack of data regarding the statistical accuracy and variability of hibernacula estimates, the Service believes that the apparent upward trend in recent years is real because the same highly qualified biologists have been consistently conducting the winter surveys at all of the largest hibernacula over the past 20 years. We anticipate that planned improvements in hibernacula survey methodology will soon provide for a greater level of confidence in population estimates.

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 two 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.

### **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.

### Hibernation

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° F). Long-term data suggest an ideal temperature range for hibernacula is between 3-6°C (USFWS 1999). A recent study of highly populated hibernacula documented a temperature range of 3-7.2°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 in press), 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 an 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 one, 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 hibernaculum 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  $156 \pm 101$  ha ( $385 \pm 249$  acres). Romme et al. (2002) calculated a mean home range near a hibernaculum in Missouri of  $667 \pm 994$  ha ( $1,648 \pm 2456$  acres) for spring and fall (based on pooled data for nine bats-male and female) and  $1,584 \pm 1,424$  ha ( $3,825 \pm 3,518$  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  $250 \pm 100$  ha ( $618 \pm 247$  acres) ( $n=11$ ) using mean convex polygons and  $361 \pm 259$  ha ( $892 \pm 640$  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 (in press) calculated a mean home range of 83 ha (205 acres) for 14 female Indiana bats in Vermont.

### Fall Swarming and Mating

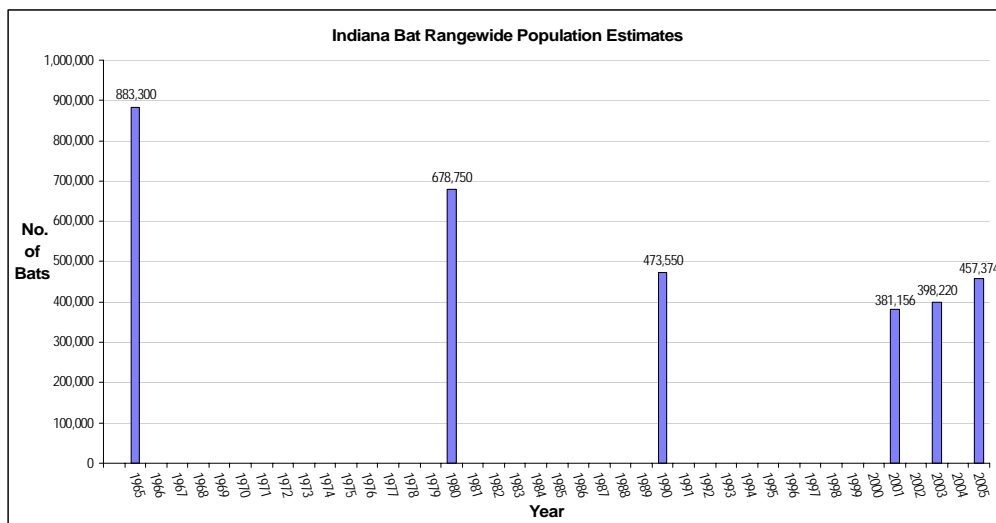
From late-August to mid-October, prior to entering the hibernacula, large numbers of Indiana bats fly in and out of cave or mine openings from dusk till dawn in a behavior called swarming. Swarming usually lasts for several weeks and mating occurs toward the end of this period. Male Indiana bats tend 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 15% increase from the 2003 estimate of 393,000 bats to the 2005 rounded estimate of 457,000 bats (USFWS, unpublished data, 2006). 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 (A. King 2006)



### **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 effects 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

### **III. ENVIRONMENTAL BASELINE**

The environmental baseline is the past and present impacts of all Federal, State, or private actions and other human activities in an action, the anticipated impacts of all proposed Federal projects in a action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process (50 CFR 402.02).

Ohio is approximately 28,701,440 acres, of which, land is about 25,900,160 acres and water and wetlands are about 2,801,280 acres (Sanders and Zimmerman 2000). The State is 30% forested today, and 96% of these forests are comprised of deciduous trees (ODNR 2006). Forests in Ohio today are highly fragmented, as seen by viewing the Ohio Land Cover Data Set created by the U.S. Geological Survey (USGS 2006). Ohio's largest section of forest is the only National Forest in the State, the Wayne National Forest (WNF). The WNF itself is fragmented by private and State lands, and is divided into three physically separated units which total approximately 238,000 acres (USFS 2006). There are over 4,000 different streams in Ohio that together create a network of an estimated 61,532 total miles of water (Sanders and Zimmerman 2000).

#### **Status of the Species within the Action Area**

The entire State of Ohio is considered to be within the core maternity range of the Indiana bat. However, the total population of Indiana bats within Ohio during the summer is unknown. The Service assumes that the Indiana bat may be present anywhere within Ohio during the summer where suitable habitat exists. We recognize that there is no way to know the actual number of Indiana bats that occur in Ohio during the summer. What we do know is that the total estimated population of Indiana bats disperse over a large area during the spring.

Indiana bats and their maternity colonies have been documented throughout the state. Indiana bats are known to hibernate in southern Ohio and south of Ohio in Kentucky and Tennessee as well as to the southwest in southern Indiana, and to the east in Pennsylvania. Researchers have documented that Indiana bats migrate over long distances (up to 300 miles) between summer and winter habitats (Murray and Kurta 2002). The summer and winter habitats for others may be in close proximity. However, when comparing the Indiana bats known wintering sites to the documented summer sites, it is apparent that there is a general trend of dispersal of Indiana bats from their hibernacula throughout the eastern U.S. This suggests that many Indiana bats are moving in a somewhat northerly direction during spring emergence. Thus, it is a reasonable assumption that a number of Indiana bats migrate into Ohio following hibernation where they remain for the summer

The Service also makes some additional general assumptions regarding the status of the Indiana bat in the action area in order to programmatically evaluate the effects of the implementation of ODOT's Statewide Transportation Program. The status of the Indiana bat within the action area of each individual ODOT project will be evaluated through a tiered consultation approach as



each project is refined and greater detail regarding activities associated with the action become available. These general trend assumptions will also assist ODOT with project planning by providing important information about the Indiana bat so that appropriate conservation measures can be incorporated at the onset of project design. These assumptions are based on existing scientific data which allows certain broad-based assumptions on the life history trends of the bat to be made. The utility of these trend assumptions beyond the scope of this programmatic may be limited. These assumptions include the following:

- Vibrations from noise disturbances within 0.5 miles of a known or suspected Indiana bat hibernaculum may cause bats to arouse from torpor during the hibernation period. Noise disturbance in locations > 0.5 miles of a known or suspected hibernaculum are not anticipated to elicit a response from hibernating Indiana bats (ODOT 2006; ESI 2004)
- A 10-mile radius around any known or suspected Indiana bat hibernaculum encompasses the fall swarming and spring staging area for Indiana bats utilizing that hibernaculum and the greatest concentration of bats during staging and swarming occur within a 5-mile radius of the hibernaculum (Kiser and Elliot 1996; MacGregor et al. 1999; Romme et al. 2002)
- A 5-mile radius around any Indiana bat capture and/or maternity record is considered as that bat's or maternity colony's entire home range (Whitaker and Brack 2002; Garner and Gardner 1992; Murray and Kurta 2004).
- Trees that are between 8 and 16 inches dbh that exhibit suitable roosting characteristics are considered potential Indiana bat roost trees (Gardner et al. 1991; Brack et al. 2004; Whitaker and Brack 2002; Chengler 2003; Gumbert et al. 2002; Kurta and Rice 2002; Schultes 2002; Butchkoski and Hassinger 2002). The minimum diameter reported for a trees used by males is 2.5 inches (Gumbert 2001). A study by Kiser and Elliot (1996) tracked Indiana bats to roost trees with diameters ranging from 4.6 to 26 inches, with an average diameter of 13 inches. Schultes (2002) radiotracked male Indiana bats in southern Ohio and found Indiana bat roosting in trees with a diameter ranging from 5.2 to 23.6 inches with the average diameter 12.6 inches. Kurta (2005) compiled all available data on roost tree diameters. Overall, males have been found roosting in trees with an average dbh of 13 inches. Although Indiana bats have been found roosting in trees  $\leq$  8 inches dbh, the vast majority have roosted in trees with a dbh > 8 inches (Schultes 2002, Gumbert 2001, Gardner et al. 1991, Kurta and Rice 2002).
- Trees that are larger than 16 inches dbh that exhibit suitable roosting characteristics are considered potential Indiana bat (primary) maternity roost trees. (Carter 2003; Gardner et al. 1991; Kurta et al. 1993; Humphrey et al. 1977; Sparks 2003; Whitaker and Brack 2002; Foster and Kurta 1999; Kurta et al. 1996; Kurta et al. 2002; Callahan 1993; Britzke 2003; Butchkoski and Hassinger 2002; Britzke et al. 2003; Belwood 2002; Palm 2003). The minimum size tree found to be used by a female is 4.3 inches (Britzke 2003). However, Kurta (2005) analyzed all available roost tree data and states that "such small trees are never used as primary roosts and most trees favored by maternity colonies are greater than 22 cm in diameter" or 8.7 inches. To date, only 2 primary maternity roost trees have been discovered in Ohio (Belwood 2002, BHE 2001). Their diameters were 15.7 and 24.8 inches. Several alternate maternity roosts associated with these primary roosts were 8.3, 11.8, and 14 inches in diameter. Kurta (2005) analyzed all available data on maternity colony roost trees and found that the average diameter is 18 inches.

- Indiana bats are not anticipated to roost in isolated trees (i.e., trees that are not part of, or connected to, a larger forested area via a tree-lined linear flight corridor (Murray and Kurta 2004; Gardner et al. 1991; Verboom and Huitema 1997; Carter 2003; Cheng 2003; Winhold et al. 2005). Likewise bat maternity colonies are more likely to occur within 0.5 miles of a perennial water source (Kurta et al. 2002; Carter et al. 2002).
- Forested areas that are 100 acres or larger are more likely to support an Indiana bat maternity colony than forested areas smaller than 100 acres. An area may be one large forested patch or may occur in smaller forested patches that are connected via tree lined flight corridors such as riparian corridors or fence rows (Brack et al. 2004; Butchkoski and Hassinger 2002; Murray and Kurta 2004). Overall, existing literature reports a great variability in the size of Indiana bat summer home ranges. Researchers have used different methodologies in attempting to describe the home range size. In comparing the most well known and cited home range studies, the Service and ODOT chose a conservative number of acres as a surrogate for the amount of suitable habitat that would be necessary to support a maternity colony of Indiana bats to assist in the effects analysis of this consultation (See Home Range, p.18). Using the studies performed by Brack et al. (2004), Butchkoski and Hassinger (2002), and Murray and Kurta (2004), we chose 100 acres as the minimum amount of suitable habitat needed to support an entire maternity colony for the purposes of this Programmatic Consultation. Any amount of suitable habitat under this number (100 acres) is more likely to provide migrating/foraging areas for females and juveniles, or support male Indiana bats.
- Indiana bats that commute between roosting and foraging areas will typically use travel corridors with trees (Murray and Kurta 2004; Gardner et al. 1991; Verboom and Huitema 1997; Carter 2003; Cheng 2003; Winhold et al. 2005).
- Removal of  $\geq 10\%$  of forest patch and/or removal of a potential Indiana bat travel corridor linking important habitat areas may have more than insignificant effects on a maternity colony. All counties within Ohio have known or possible occurrences of the Indiana bat. The local summer population of Indiana bats in Ohio, and maternity colonies in particular, is thought to be most stressed by the lack of or loss of available suitable habitat (USFWS 2006).

With these assumptions, we believe that Indiana bats may occur throughout Ohio during the non-hibernation period wherever suitable habitat occurs. Additionally, maternity colonies may occur throughout the state wherever there is sufficient suitable habitat (i.e., 100+ acres) occurs.

To estimate the status of the Indiana bat in the action area, both the known capture records and the availability of potentially suitable habitat are considered. The amount of potentially suitable habitat within the action area was determined by extracting the Ohio forest cover GIS layer from the USGS created Ohio National Land Cover Data Set (OLCD), which is a subset of the National Land Cover Data Set (NLCD). The OLCD was revised in 2000 and originally used satellite imagery circa 1992 supplemented with other ancillary data (elevation data, aerial photos, wetland information, etc.) where available. The data set has a spatial resolution of 30 meters, meaning the smallest pixel of land cover is 30 meters squared. This level of data was used in defining 14 different land cover classes in Ohio. Two land cover classes were chosen from this list as possible Indiana bat habitat: woody wetlands and deciduous forest. In the OLCD, woody

wetlands are defined as areas where forest or shrubland vegetation accounts for 25-100% of the cover and the soil or substrate is periodically saturated with or covered with water (USGS 2006). Deciduous forest is defined as areas dominated by trees where 75% or more of the tree species shed foliage simultaneously in response to seasonal change (USGS 2006).

The following describes the status of the Indiana bat within each of the 5 management units utilizing the known records and the current estimate of potentially suitable habitat. For purposes of this programmatic consultation, Ohio has been divided into 5 Management Units (Figure 1, page 7). The Management Units were chosen by taking into account differing land use, vegetative land cover, and Indiana bat survey data (and thus, known suitable habitat) across the State. Major factors in choosing the boundaries for each unit are discussed below.

### South Unit

The South Unit is the most heavily forested section of Ohio. The total area of the unit is 5,819,740 acres. Of this, approximately 2,870,669 acres (49 %) are potentially suitable for the Indiana bat (woody wetlands and deciduous forest). Woody wetlands are defined as areas where forest or shrubland vegetation accounts for 25-100% of the cover and the soil or substrate is periodically saturated with or covered with water (USGS 2006). Deciduous forest is defined as areas dominated by trees where 75% or more of the tree species shed foliage simultaneously in response to seasonal change (USGS 2006).

Bat surveys in the South Unit have been primarily on the WNF and areas under State ownership. An Indiana bat maternity colony was documented in Hocking County in 1997 on the Athens Unit of the WNF (Kiser and Bryan 1997). Another maternity colony was documented near the Clermont-Warren County line in 1996 (Belwood 2002). This maternity colony was discovered when a large tree was felled by a landowner. The landowner observed numerous bats coming out of the trees after it was on the ground and contacted a local bat expert for assistance. Although the primary maternity roost tree was removed, a survey in 2000 confirmed that the colony still persisted in the immediate area (Belwood 2002).

Summer surveys have also documented Indiana bats in Hocking, Athens, Butler, Hamilton, Highland, and Lawrence counties on Federal, State, and private lands. Fall swarming surveys at cave and mine portals have also documented Indiana bats in and around the Athens and Ironton Units of the WNF.

One confirmed Priority 3 hibernacula occurs in an abandoned limestone mine in Lawrence County of the Ironton Unit of the WNF. In 2003, 150 Indiana bats were counted in this mine and in 2005, the census documented 333 Indiana bats. Based on the multiple documented accounts and the availability of potential suitable habitat in the South Unit, it is likely that Indiana bats, including maternity colonies, occur throughout this unit.

### East Unit

The East Unit is a somewhat even mix of forested and unforest lands. This unit is impacted by past and present surface coal mining activities. The total area of this unit is 4,198,537 acres. Of this, approximately 2,170,808 acres (52 %) are potentially suitable for the Indiana bat.

Despite a number of bat surveys, Indiana bats have yet to be documented from this unit. We believe, however, it is likely that Indiana bats, including maternity colonies, occur throughout this unit. The basis for expecting Indiana bats to occupy the East Unit are: 1) past survey efforts were typically small in scale (i.e., a two-night sampling effort on a specific proposed coal-mining site) and thus, have not been conducted as part of a larger, landscape-level effort targeting the best available habitat, 2) maternity colonies are documented nearby this unit in the Northeast and South Units in areas with similar, unglaciated forested habitats, and 3) Other records, including maternity colonies and hibernacula, exist in Pennsylvania and West Virginia to the east, southeast, and south of this unit. Thus, it is reasonable to expect that maternity colonies also occur within the East Unit.

### Northeast Unit

The Northeast Unit has forest cover with a mosaic of many wetlands and woody wetlands. The total area of this unit is 4,606,932 acres. Of this, approximately 1,695,314 acres (37 %) are potentially suitable for the Indiana bat. Indiana bat habitat in the greater Cleveland and Akron-Canton areas of this unit are under considerable threats from commercial and residential development.

The presence of Indiana bats in the Northeast Unit has been well documented. Maternity colonies have been documented in Ashtabula, Cuyahoga, and Summit counties. A metropark in Summit County has been extensively studied for bats. This park contains a large sandstone ridge with fissures where thousands of bats of 7 species have been captured during the spring, summer, and fall, including 8 Indiana bats. Another Indiana fall swarming site was documented in 2003 at a sandstone fissure in Ashland County near the Richland County line. Indiana bats have also been documented on the Cuyahoga Valley National Park and several other areas on county metroparks and a State Wildlife Area.

### West Unit

The West Unit is comprised of mainly agricultural lands with small, isolated wood lots. The total area of this unit is 8,096,979 acres. Of this, approximately 675,561 acres (8 %) are potentially suitable for the Indiana bat. Due to its fragmented composition, roosting and foraging areas, including forested travel corridors, may be limiting for the Indiana bat in this unit.

A Priority 2 hibernacula is located in this unit in an abandoned limestone mine in Preble County. Winter census records since 1994 indicate that between 9,500 and 10,000 Indiana bats hibernate in this mine each winter. The most recent winter census, conducted in 2005, documented approximately 7,500 Indiana bats. The cause of this recent decrease in numbers is not known.

Maternity colonies have been documented in Paulding and Greene counties. The Paulding County record is from 1976. Additional surveys have not been performed at this location so the status of Indiana bats at this site is not known. The Greene County record is more recent (2000) when Indiana bats were captured and radiotracked during a bat inventory study at the Wright-Patterson Air Force Base.

Overall, only a few bat surveys have been conducted in this unit. Residential and commercial development pressure is relatively low in the unit, with the exception of the greater Cincinnati

and Dayton areas. Thus, there have been few bat surveys conducted in conjunction with proposed development activities. Land ownership in the West Unit is predominantly private. Landscape level bat inventories have not been conducted in this unit to date. Indiana bats have been documented at a few locations in this unit as well as to the south, west, east, and north of this area. Indiana bats are likely present throughout this unit wherever sufficient suitable habitat occurs.

### Central Unit

The Central Unit is similar to the West Unit and is comprised of mainly agricultural lands with small, isolated wood lots. The total area of this unit is 3,685,086 acres. Of this, approximately 702,459 acres (19 %) are potentially suitable for the Indiana bat. Due to its fragmented composition, roosting and foraging areas, including forested travel corridors, may be limiting for the Indiana bat in this unit.

Few bat surveys have been conducted within the Central Unit. A maternity colony was located in Pickaway County along Big Darby Creek in 2006. The Service assumes that Indiana bats likely occur throughout this unit wherever sufficient suitable habitat conditions occur.

## **Factors Affecting Species Environment within the Action Area**

### *Land Management*

Mature forest with canopy gaps and open understories is important to this species, both during the summer and during the swarming period; however forest structure has changed over time. Researchers believe that the action area was primarily forested, but about 10 percent of the area was disturbed each decade by weather-related events or by forest pests and diseases (Runkle 1982). These disturbances ranged in size from canopy gaps to larger blowdowns, and were scattered across the landscape. In the central hardwood forest, the climate warmed and became drier 5,000 to 8,000 years ago, and an increase in fire occurred. Native American people utilized fire to clear forest from around their camps, clear brush for improved hunting, and for better visibility for protection against enemy attacks (Fralish 2004). As a result of these factors, the action area was a mosaic of early-, mid-, and late-successional forest habitats. As European immigrants moved into the action area in the late-1700s, the forest was cleared for home sites, agriculture, lumber and mining. By 1940, only about 15% of the forest cover was still present in Ohio (Ohio Division of Forestry 2004). Active fire suppression began in the 1920s. Today, the Ohio Division of Forestry estimates that almost 30% of Ohio is now covered by forest.

While forest cover has increased from the 1940s, the structure and composition of forest differs from what was present before Europeans first started moving into the area. Based on written accounts of early settlers and travelers in the Ohio Valley, forests were described as being park-like with large, widely spaced overstory trees and relatively little undergrowth of woody vegetation. Chestnut and oak forests dominated the landscape until the early 1900s, but these changed to oak-hickory forests after the chestnut blight occurred. An analysis of the structure, composition and condition of overstory trees in research plots located in southeastern Ohio suggests that today's forests are denser than that reported for old growth oak-hickory forests and for presettlement forests (Sutherland et al. 2003; Yaussy et al. 2003). Changes in disturbance patterns over the past 75 years have been suggested as reasons why an increase in shade tolerant

species (e.g., red maple) is occurring in greater abundance in the forest understory and midstory (Abrams 1992; Abrams 1998). There is no scientific information available at this time to know whether the increasing density of forest communities is a contributing factor to the Indiana bat's decline. Forested lands within the action area are managed in a variety of ways with the vast majority of land in Ohio, over 95%, being in private ownership (ODNR 2001). This has created a mosaic of habitat conditions across the action area.

### *Mining*

The East Unit and the eastern portion of the South Unit and much of the East Unit contain oil, gas, and coal deposits. Other industrial minerals such as sand, gravel, limestone, clay, shale, sandstone, and salt are also found throughout the state. Extraction of these resources over the past 150 years has impacted land cover and degraded water quality, especially in the South and East Units. Today, remnants of this industrial era are present in the form of abandoned surface and underground mines. Features associated with these abandoned mine lands affect riparian and water quality.

Acid Mine Drainage (AMD) is water that is affected by passage through, or alteration by, coal or abandoned coal mine environments. The products of AMD formation, acidity and iron, can devastate water resources by lowering the pH and coating stream bottoms with iron hydroxide. Streams in the action area that are impacted from AMD may have a lowered productivity of aquatic biota, including insects that Indiana bats prey upon. Furthermore, waterways severely impacted by AMD may not provide suitable drinking water sources for Indiana bats. Despite the past impacts to surface water within southeastern Ohio, the area supports a high density of bats including Indiana bats and 7 other species. This indicates that southeastern Ohio currently provides ample foraging and drinking sources for bats.

## **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 actions* 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.

A project footprint containing all the on-the-ground impacts of any roadwork was established around each linear project. The footprints assigned to project types were generous in nature, giving ODOT a conservative (i.e., a likely over-estimate) estimate of impacts across the State. The impact layer was overlain with a statewide layer of potentially suitable Indiana bat habitat which computed a figure of all the possible Indiana bat habitat that may be impacted due to road construction. ODOT estimates that of the 8,112,811 forested acres in Ohio, ODOT projects over the next 5 years may remove up to 22,118 acres, or 0.27%, of forest statewide (Table 2).

Overall, a loss of 0.27 percent of available habitat does not appear meaningful in terms of Indiana bat viability. However, for Indiana bats, it is not just the amount of forest that influences the fitness of Indiana bats. A loss of a single tree could have substantial impacts while the loss of multiple acres of forest may have only minimal impact. The paramount factors are timing and the specific ecological functions the area serves for Indiana bats. Hence, our analyses must evaluate not only the impact from total amount of habitat loss, but also, the consequences of impacts to the ecological functions of the habitat for Indiana bats.

**Table 2.** Total Estimated Forest Impacts from ODOT Projects for the 5-Year Period Starting in 2007.

Management Unit	Total Forest Cover (acres)	ODOT Total Impact* (acres)	% Forest Impacted by ODOT
West	675,561	1,565	0.23 %
South	2,870,669	4,679	0.16 %
Central	702,459	2,280	0.32 %
Northeast	1,695,314	6,370	0.38 %
East	2,170,808	7,224	0.33 %
Statewide Total	8,114,811**	22,118	0.27 %

\* ODOT estimated area of tree removal over next 5 years (starting in 2007)

\*\* Ohio total acreage = 25,900,160 acres; 30 % of Ohio is forested (ODOT 2006)

Our analytical approach for our effect analyses is to identify: (1) the environmental consequences Indiana bats will be exposed to, (2) who will be exposed (males vs maternity colonies), and (3) how such individuals will respond upon exposure. In general, the environmental consequences associated with implementation of ODOT's Statewide Transportation program include: reduction in foraging habitat, loss of roost trees, and disturbance from human presence. We will, therefore, determine who will be exposed and how such individuals are expected to respond. The responses of individuals exposed directly during individual project activities or the associated environmental consequences will vary depending on the timing and scale of project actions. Once we understand how exposed individuals will respond, we will assess how these responses affect their fitness and ultimately the reproduction, numbers, and distribution of the species rangewide.

### **Beneficial Effects**

Certain offsetting or mitigative measures performed by ODOT may provide a benefit to the Indiana bat. The following activities may benefit the Indiana bat through habitat restoration and enhancement:

1. Stream and/or wetland mitigation (that is in potential Indiana bat habitat) that aims to restore riparian/forested wetland areas and is completed in compliance with the Army Corps of Engineers Section 404 Permits and the Ohio Environmental Protection Agency's 401 Water Quality Certification Process. In turn, bats may benefit from the restoration and protection of stream and wetland habitats which may provide suitable roosting, foraging, and commuting habitat.
2. Native tree planting that will supply future suitable habitat for the Indiana bat.
3. Invasive species plant control that will create better quality suitable habitat for the Indiana bat. Invasive plant species, such as bush honeysuckle, can spread quickly through the forest understory creating dense vegetative clutter. Dense understory clutter decreases the suitability of a forested area for foraging by bats

These measures may benefit the Indiana bat by creating and/or improving habitat. Restoration of wetlands and streams and tree planting activities may benefit the Indiana bat in future years as new habitat is created and/or existing habitat is improved. Control of invasive plant species may have a more immediate benefit to bats as existing habitat is improved.

### **Direct and Indirect Effects of Programmatic Category 1 and 2 Projects**

#### *Programmatic Category 1 Projects*

Programmatic Category 1 projects (PC1) will be submitted to the Service for site-specific consultation. ODOT will make an ESA section 7(a)(2) effect determination for the Indiana bat, provide a justification for that determination, and request Service concurrence. The Service anticipates that PC1 projects are not likely to adversely affect the Indiana bat. The site-specific review will ensure the accuracy of this assumption and fulfill ODOT's and FHWA's ESA section 7(a)(2) responsibilities on a project-by-project basis for PC1 projects.

PC1 projects include those requiring removal of  $\leq 20$  potential roost trees in the Northeast, South, and East Units or  $\leq 10$  potential roost trees in the West and Central Units, projects will not require removal of potential maternity roost trees, and will not occur within 5 miles of an Indiana bat capture record. Hence, the Service anticipates that PC1 projects will not alter the essential character, function, or suitability of an area for the Indiana bat. Furthermore, tree removal for this category of projects typically occurs within existing rights-of-way where past roadway clearing, construction, maintenance, and operational activities have occurred (ODOT 2006). It is possible that bats could be roosting in trees along a right-of-way, but given the small number of trees that would be removed for any individual project,  $\leq 20$  or  $\leq 10$  depending upon unit, it is unlikely that any of the trees would be occupied. Therefore, the removal of occupied roost trees while implementing PC1 projects is not reasonably foreseeable. For these reasons, we believe exposure to PC1 projects are not likely to elicit noticeable, measurable or perceivable effects on the fitness of these individuals. Therefore, the Service anticipates that any adverse effects to the Indiana bat from PC1 projects will be insignificant.



### *Programmatic Category 2 Projects*

Programmatic Category 2 projects (PC2) will be submitted to the Service for site-specific consultation. ODOT will make an ESA section 7(a)(2) effect determination for the Indiana bat, provide a justification for that determination, and request Service concurrence. The Service anticipates that PC2 projects are not likely to adversely affect the Indiana bat. The site-specific review will ensure the accuracy of this assumption and fulfill ODOT's and FHWA's ESA section 7(a)(2) responsibilities on a project-by-project basis for PC2 projects.

The direct and indirect effects of PC2 projects on the Indiana bat are similar to the effects associated with PC1 projects. The key differences between PC1 and PC2 projects are the PC2 projects will occur within areas that could support a maternity colony (but less than 10% of the suitable habitat will be removed) and/or will occur within 5 miles of an Indiana bat capture. Tree removal activities associated with PC2 projects will be conducted outside the Indiana bats' maternity season thus avoiding all potential direct impacts to maternity colonies and to minimize the potential to remove any occupied roost tree. All projects in this category will include seasonal tree cutting (after September 15 and before April 15) and will not remove potential maternity roost trees.

As activities associated with PC2 projects are typically confined to within existing rights-of-way where past roadway clearing, construction, maintenance, and operational activities have occurred (ODOT 2006), it is unlikely that all or a significant portion of a bat's home range or foraging area would be removed. Hence, we anticipate that PC2 projects will not alter the essential character, function, or suitability of an area for Indiana bats. We anticipate that any response by Indiana bats to PC2 project activities will not rise to the level of affecting individual fitness and will likely be undetectable. That is, there will not be any noticeable, measurable or perceivable effect on the fitness of these individuals. Therefore, the Service anticipates that any adverse effects to the Indiana bat from PC2 projects will be insignificant.

### **Programmatic Category 3 Projects**

Programmatic Category 3 projects (PC3) will be submitted to the Service for site-specific consultation. ODOT will make an ESA section 7(a)(2) effect determination for the Indiana bat, provide a justification for that determination, and request Service concurrence. The Service anticipates that PC3 projects are likely to adverse effects to the Indiana bat.

The Service anticipates that Programmatic Category 3 projects (PC3) have the potential to adversely affect Indiana bats by altering the essential character, function, or suitability of an area for the Indiana bat. The level of impact on the Indiana bat will vary greatly depending upon the site-specific details of each project and how individual projects will impact the local landscape. A typical PC3 project is one which may remove a large number of potential roost trees (more than 10 or 20 depending upon the Unit), remove one or more potential maternity roost trees, impact a known or potential hibernacula, impact Indiana bat fall swarming or spring staging areas, and/or will reduce a 100+ acre forested area by more than 10 % in the West Unit.

PC3 projects will be submitted to the Service for site-specific Tier II consultation. ODOT will make an ESA section 7(a)(2) effect determination for the Indiana bat, provide a justification for that determination, and request Service concurrence. If the proposed action is likely to adversely affect Indiana bats, a Tier II formal consultation will ensue. The site-specific review will fulfill ODOT's and FHWA's ESA section 7(a)(2) responsibilities on a project-by-project basis for PC3 projects.

### *Effects of Avoidance, Minimization and Mitigation Measures for PC3 Projects*

ODOT, in concert with the Service, has developed conservation measures to minimize and mitigate the potential direct impacts for PC3 projects that are "likely to adversely affect" the Indiana bat (See Description of Proposed Action). ODOT will identify the existing forested habitat suitable for Indiana bat foraging, roosting, swarming, hibernating, and staging within the action area of each individual PC3 project. As discussed above, ODOT will incorporate seasonal restrictions on the removal of potential roost trees for PC3 projects whenever possible to avoid directly affecting roosting Indiana bats. Removal of potential roost trees and removal of any trees within riparian area would be further restricted within 5 miles of a hibernaculum so that removal only occurs between November 15 and March 15. This will avoid directly impacting Indiana bats during the fall swarming and spring staging periods. We anticipate that the implementation of avoidance, minimization, and mitigation measures as part of the proposed action will help to minimize and offset adverse effects to the individuals and may insure the availability of suitable habitat for Indiana bat maternity colonies in the future.

Projects that require blasting or other loud road work that will cause vibrations within 0.5 miles of a hibernaculum will only be performed between April 15 and September 15. Therefore, effects to hibernating bats will be avoided.

For projects that require the removal of a potential maternity roost where seasonal cutting dates cannot be followed, ODOT will either have a mist-net survey or an emergence survey conducted to determine the presence or probable absence of a maternity colony (See OHAF, Section 2, Option 1). If there is evidence of a maternity colony, then appropriate avoidance, minimization, and mitigation measures will be incorporated into the project to minimize impacts on bats. Such measures include actions like establishing limits on the timing, duration, or magnitude of specific activities, establishing protective buffer zones around maternity roost trees, and post-construction monitoring of a colony to evaluate the effectiveness of conservation measures.

To further minimize the overall impacts to Indiana bats, ODOT will carry out one or more mitigation measures for each project that is 'likely to adversely affect' this species. ODOT and the Service developed a prioritized list for mitigation measures for each Management Unit. Mitigation activities in the West and Central Units, for example, will focus on reforestation of stream corridors and contributing funds to a research bank to develop and conduct surveys within these units to increase our knowledge of Indiana bat habitat use within a highly fragmented landscape. Other mitigation measures include protection of habitat through conservation easement or deed restriction, protection and/or reforestation of forested wetlands, and control of invasive plant species (i.e., bush honeysuckle).

The mitigation measures to be carried out in the West and Central Units will help to offset the loss of habitat from the implementation of ODOT's Statewide Transportation Program. These measures focus on protection and restoration of habitat in concert with increasing the knowledge of Indiana bat usage of habitat in across a fragmented landscape. More information on Indiana bats are utilizing this landscape will allow for more effective land protection, enhancement, and management in these units.

Mitigation activities in the South, East, and Northeast Management units will focus on the protection/restoration of riparian areas and tree planting to create future suitable habitat, create future travel corridors, and restore connectivity of forested areas. Additional mitigation measures include protection of land/habitat through conservation easement or deed restriction to offset loss of suitable habitat. These activities will help to offset loss of habitat from the implementation of ODOT's Statewide Transportation Program by focusing on protection, enhancement, and management of high quality Indiana bat habitat within these units.

The goal of the habitat protection and enhancement will be to enhance Indiana bat habitat in the long term by providing forested habitat, improving connectivity among blocks of existing habitat, and creating larger blocks of forested bat habitat. Improved connectivity of habitat between roosting and foraging areas is expected to improve habitat conditions for Indiana bats. Permanently protected plantings along stream corridors will also benefit water quality in the long term, as the plantings will provide a vegetated buffer that will reduce runoff, and associated sedimentation, from adjoining roadways, commercial/industrial developments, and agricultural areas. In the long term, mitigation plantings will provide a diverse woodland that is well stocked with species of trees that are known to provide Indiana bat roosting habitat.

#### *Direct Effects of Programmatic Category 3 Projects*

Over the next 5 years, ODOT anticipates the removal of up to 22,118 acres of suitable Indiana bat habitat within Ohio (see Table 2 for breakdown per Management Unit). ODOT will implement seasonal restrictions on removal of potential roost trees for all PC3 projects except for up to 5 projects per year (ODOT, December 12, 2006 email).

With the exception of five or fewer projects, removal of an occupied roost tree is not anticipated since seasonal tree removal restrictions will be adhered to. Also, removal of an occupied maternity roost tree is not anticipated since ODOT will not remove any potential maternity roost trees between April 15 and September 15 (unless an emergence survey was performed and did not detect emergence of any bats and/or a mist-net survey was performed and no Indiana bats were captured). Furthermore, tree removal activities within 5 miles of any known or suspected hibernacula will always occur between November 15 and March 15 when Indiana bats are hibernating. Thus, direct impacts may occur only during those projects that do not adhere to the seasonal tree-cutting restrictions. ODOT believes that there may be up to five projects annually in which they will not be able to adhere to the seasonal tree-cutting restrictions. In these situations, they will not cut occupied maternity roosting trees, so males and non-reproductive females may be directly exposed. Effects to Indiana bats during tree removal activities carried out between April 15 and September 15 may range from injury or death if occupied roost trees are felled to harrassment of bats due to noise disturbance. Hence, we anticipate that male or non-reproductive females could be directly adversely affected by PC3 project activities on 5

occasions per year through the clearing of occupied roost trees. As these individuals roost singly or in small groups, we do not anticipate that the take of these individuals will yield noticeable effects on reproduction, numbers or distribution of Indiana bats in the action area.

Project construction activities may also directly expose roosting Indiana bats to noise and vibrations cause by tree clearing activites and construction equipment. The response of Indiana bats exposed to these disturbances while roosting could range from no perceivable response to avoidance of the area. Typically, ODOT projects are linear and occur in previously disturbed areas with existing roadways. Thus, these project areas would likely have existing vehicle noise. Additional noise from construction activities is not likely to elicit a measurable response from Indiana bats roosting in the surrounding landscape.

### *Indirect Effects of Programmatic Category 3 Projects*

The continued implementation of ODOT's Statewide Transportation Program through January 2012 may indirectly affect Indiana bats through the removal of suitable roosting, foraging, and commuting habitat during the winter hibernation period. The extent of the habitat removal will vary by project, but because of the linear nature and scope of projects considered in this consultation, PC3 projects are not likely to alter the character of the landscape such that the reproductive output of a colony would be adversely affected. The rationale for this belief is: (1) transportation projects are typically linear and often occur along previously disturbed rights-of-way thereby minimizing the chance of impacting a substantial proportion of a traditional homerange of an Indiana bat maternity colony, and (2) ODOT will consult with the Service to identify project specific conservation measures that may be employed to avoid and/or minimize impacts to maternity colonies in these units (e.g., restricting construction activities to daylight hours to avoid impacts to foraging bats).

Nonetheless, removal of habitat during the winter months may adversely affect individuals. Indiana bats, and in particular maternity colonies, exhibit strong site fidelity to their traditional summer colony areas (Kurta et al. 2002; Garner and Gardner 1992; Gardner et al. 1991; Humphrey et al. 1977; Gardner et al. 1996; Cope et. al 1974). As discussed in the Status of Species section, these traditional summer areas are essential for successfully raising their young. Upon returning from hibernation, Indiana bats may be forced to alter their breeding, feeding, and sheltering patterns if substantial portions of their homeranges are modified. The specific effects arising from altering these life history processes are discussed below.

### Impacts from Modifications to Roosting Habitat

Projects that require the removal of one or more potential primary maternity roost trees outside of the Indiana bats' maternity season can result in adverse effects to colony members upon their return to maternity areas following hibernation. When a primary roost tree becomes unsuitable, members of a colony may initially distribute themselves among several previously used alternate roost trees (USFWS 2002; Kurta et al. 2002). It is not known how long it takes for the colony to attain the same level of roosting cohesiveness that it experienced prior to the loss of an important primary roost tree. It is likely that due to the ephemeral nature of roost trees, the Indiana bat has evolved to be able to relocate replacement roosts, if available, when their previously-used roost trees become unsuitable. If pregnant females are required to search for new roosting habitat in the spring, this effort may 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, and food availability is unpredictable.

Until the bats from the colony locate another desirable primary roost tree and reunite, it is possible that some individual members of a colony will be subject to increased stress resulting from: (1) having to search for a replacement primary roost tree, which increases energy expenditure and risk of predation; (2) having to roost in alternate trees that are less effective in meeting thermoregulatory needs; and (3) having to roost singly, rather than together, which decreases the likelihood in meeting thermoregulatory needs, thereby reducing the potential for reproductive success. These effects can be compounded because they will occur in the spring when fat reserves are low or depleted and bats may be stressed from the energy demands of migration. This could expose them to an increased risk of mortality and/or failed reproduction.

We anticipate that it is unlikely that the response of individual females will rise to the level of failed reproduction or death. Colonies are anticipated to retain cohesiveness because the essential character of these areas will not be negatively affected, and hence, bats will likely be able to stay within their traditional homeranges. That is, they are able to use other suitable trees within the colonies homerange. Rather, we anticipate that effects to individuals will range from undetectable to a brief delay in giving birth.

Adult male and non-reproductive female Indiana bats may also be indirectly exposed to loss of roosting habitat. In general, effects on these individual bats would 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 non-reproductive bats will be less than the effects to reproductively active females. The Service anticipates that indirect effects to non-reproductive Indiana bats from the loss of roosting habitat will be insignificant.

#### Impacts from Modifications to Foraging Habitat

Another indirect effect of the proposed project on the Indiana bat in the action area will be the alteration and loss of foraging habitat. After clearing is completed on individual project areas, foraging habitats may no longer be available or may be reduced in quality and/or quantity. Effects to bats whose foraging areas lie entirely or mostly outside individual project areas are anticipated to be minimal. However, individuals, whose foraging areas occur entirely or mostly within a specific project area or whose foraging areas will be disconnected due to the project (i.e., loss of a suitable travel corridor), may expend an increased amount of energy to establish new commuting patterns and/or home ranges. Bats in this scenario could be harmed due to displacement from their home range and thus incur decreased fitness. Additionally, bats may be subject to increases in inter- and intra-specific competition in situations where available foraging habitat is limited. Given the linear nature of transportation projects, it is unlikely that PC3

projects will impact a substantial portion of any one foraging area. It is more likely that smaller portions of several individual foraging areas will be impacted. Therefore we do not anticipate any noticeable effects from loss of foraging habitat.

Additionally, surface water quality may be impacted by individual projects. Implementation of projects may require the filling or alteration of wetlands and stream habitat by relocating or converting streams through drainage structures. Sediment, herbicides, and other contaminants, could affect water quality through erosion, vegetation management, and accidental spills during any phase of a project from construction to operation. Insects associated with these aquatic habitats make up part of the diet of the Indiana bat. Therefore, a change in water quality can affect the prey base of the species. Decreases in water quality through contamination and the destruction of wetlands and stream habitats may reduce the availability of aquatic insects and reduce the availability or quality of suitable drinking sources.

Adverse effects to Indiana bats from this decrease in aquatic insect prey and drinking sources could range from those which are insignificant to those resulting in harm by significantly impairing the ability of bats to feed. Of course, the level of impact on individual bats will vary depending upon the magnitude and duration of water quality impacts and the availability of suitable foraging and drinking opportunities in the surrounding landscape. The diet of Indiana bats is not restricted to just aquatic insects as they also forage on terrestrial insects. Furthermore, their diet appears to vary across their range, as well as seasonally and with age, sex and reproductive-status (Murray and Kurta 2002; Belwood 1979). We anticipate that impacts to water quality will typically be temporary impacts, occurring during project construction activities. Thus, we anticipate that the response of Indiana bats exposed to decreased water quality will range from no response to a temporary modification of foraging patterns. We anticipate that the temporary reductions in water quality will not cause a decrease in fitness of individual Indiana bats and will therefore be insignificant.

### **Summary of Effects**

The Service anticipates that Indiana bats may incur both direct and indirect effects from the implementation of ODOT's Statewide Transportation Program through January 2012. The intensity of effects will differ by activity, season, condition, and home range of individual bats. Direct and indirect effects to Indiana bats are anticipated during clearing, construction, and operational activities from the removal of habitat and due to noise disturbance.

ODOT anticipates that up to 22,118 acres of potential suitable Indiana bat habitat will be removed due to the implementation of their Statewide Transportation Program over the next 5 years. Direct take (killing or injuring) of Indiana bats during project implementation will typically be avoided during the maternity period due to project specifications that avoid cutting of potential roost trees from April 15 to September 15 whenever possible. Clearing of potential roost trees between April 15 and September 15 may be unavoidable for up to 5 projects annually, thus, injury or death of individual Indiana bats may occur during clearing activities if occupied roost trees are felled. We anticipate that males and non-reproductive females maybe exposed to these direct impacts. As these individuals roost singly or in small groups, we do not anticipate, however, that the take of these individuals will yield noticeable effects on reproduction, numbers or distribution of the Indiana bat within the action area.

Adverse effects to hibernating Indiana bats should be avoided because projects that require blasting or other loud road work that will cause vibrations within 0.5 miles of a hibernaculum will only be performed between April 15 and September 15 outside of the bat's hibernation period. Thus, no direct adverse effects to hibernating bats are anticipated.

Indirect effects on reproductive female Indiana bats may occur but we anticipate that effects to individuals will range from undetectable to a one or several day delay in parturition. Furthermore, we do not anticipate that the fitness of reproductive and non-reproductive Indiana bats will be decreased due to the removal of roosting and foraging habitat during the hibernation period.

## **V. CUMULATIVE EFFECTS**

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

Throughout the State of Ohio, it is unknown how many acres of suitable habitat for the Indiana bat could be altered or lost by these future actions. Future State, tribal, local, or private actions would have varying degrees of effects on the Indiana bat from no effect to adverse effects. Permanent conversion of forested habitat to unsuitable habitat would have the greatest potential impacts to the species.

The vast majority of land in Ohio, over 95%, is in private ownership (ODNR 2001). Although we are aware of no major non-Federal actions that are reasonably certain to occur within Ohio, it may be expected that some activities, particularly on private lands, could have a progressive negative effect on Indiana bats. Ohio's human population has been growing steadily since statewide censusing began. In 2004, Ohio had an estimated 11,459,011 people and has a projected population of approximately 1% per year (ODOD 2006). Human population growth is typically accompanied by increase urbanization, including land development. Land development could result in the permanent loss of potential Indiana bat habitat. Also actions performed on private lands that may adversely affect the Indiana bat include timber harvest, fire suppression and pesticide application. Also, when done properly, forestry practices can also be compatible with Indiana bat conservation (BCI 2001).

Despite the continued population growth in Ohio, forest land is increasing in the state, and Ohio's forests are maturing (OSU 2007). In fact, tree growth continues to outpace removals by a ratio of more than 2 to 1 (OSU 2007). Approximately 30% of Ohio is currently forested in comparison with only 12 % in 1940 and forest land (OSU 2007; USGS 2006). Thus, the overall character of the forested landscape may be improving for the species in the state although tree removal actions by private landowners individually may result in adverse impacts to Indiana bats. Assuming that Ohio's forests will continue to mature, private forestry activities collectively throughout the state may not significantly decrease the species numbers, reproduction, and distribution.

## **VI. CONCLUSION**

After reviewing the current status of the Indiana bat, the environmental baseline for the action area, the effects of the implementation of ODOT's Statewide Transportation Program through January 2012, 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. 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, thus, no destruction or adverse modification of that critical habitat is anticipated.

As described in our Effects analysis, we anticipate up to 22, 200 acres of potential suitable Indiana bat habitat may be removed during implementation of ODOT's Statewide Transportation Program over the next 5 years. Accompanying this loss of habitat, we anticipate individuals may be injured or killed due to the removal of occupied roost trees between April 15 and September 15 for up to 5 PC3 projects per year. We also anticipate indirect effects to roosting pregnant females upon return from hibernation. Although at first appearance, a loss of this magnitude seems substantial, we believe that avoidance, minimization, and mitigation measures proposed will minimize and offset adverse effects to the individuals and insure the availability of suitable habitat for Indiana bat maternity colonies in the future. Specifically, we believe no reproductive females or young will be directly exposed to tree-felling activities. Male and non-reproductive female bats that are exposed are likely to be only a single or few roosting bats. Reproductive females may be indirectly exposed, but we believe that the responses to this indirect exposure will lead to only a short delay in parturition. Hence, we do not expect any perceivable impacts to maternity colonies or the overall Ohio Indiana bat population from the proposed action. As such, we also do not anticipate any reductions in the reproduction, numbers, or distribution of the species rangewide. Therefore, we believe the proposed action is not reasonably expected to appreciably reduce the likelihood of survival and recovery of the species.

### **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 FHWA so that they become binding conditions of any funding issued to ODOT, as appropriate, for the exemption in section 7(o)(2) to apply. FHWA has a continuing duty to regulate the activity covered by this Incidental Take Statement. If FHWA:

- 1) Fails to assume and implement the terms and conditions or
- 2) Fails to require ODOT to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are applied to the funding, the protective coverage of section 7(o)(2) may lapse.

In order to monitor the impact of incidental take, FHWA must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR §402.14(i)(3)].

### **Amount or Extent of Take Anticipated**

In this incidental take statement, we are evaluating the incidental take of Indiana bats that may result from the implementation of ODOT's Statewide Transportation Program through January 2012. With the implementation of this Program we anticipate some adverse effects to occur to individual Indiana bats. The level of take anticipated is greatly influenced by the implementation of the proposed conservation measures. Our incidental take analysis assumes full compliance with these conservation measures. Four measures are particularly influential in our analysis: (1) seasonal tree-cutting restrictions, (2) no more than 5 projects annually will be exempt from the tree-cutting restrictions, (3) under no scenario will known occupied maternity trees be cut during the active season, and (4) under no scenario will known or potential roost trees within 0.5 miles of a known or suspected hibernaculum be cut between March 15 and November 15.

As explained in the Effects section, we anticipate based on the proposed conservation measures that a few occupied non-maternity roost trees may be cut during the implementation of PC3 Projects. These trees are likely to be occupied by either one to a few bats. It is reasonable to assume that only a subset of these individuals will be directly taken through injury or death (Bellwood 2002) and that most of the individuals in the occupied roost tree will escape unharmed. Although very difficult to predict, we anticipate that an unknown occupied roost tree could be cut during the implementation of each PC3 project when seasonal restrictions on tree removal cannot be implemented. ODOT anticipates that they will not be able to implement the seasonal tree cutting restrictions for no more than 5 projects annually. Given that only single or a small group (n=3) of roosting bats may be exposed in any one project, we anticipate that no more than 15 Indiana bats (= up to 3 bats for each of the 5 projects) will be incidentally taken each year over the next 5 years for a total of 75 male or non-reproductive Indiana bats.

Incidental take of Indiana bats will be difficult to detect for the following reasons: 1) the species is highly motile, 2) the species occurs in habitat (e.g., trees) that makes detection difficult, and 3) finding dead or moribund bats is unlikely due to a small body size and the likely scavenging of specimens by predators. However, we believe the level of take of this species can be monitored by tracking the level of habitat modification and adherence to conservation measures.

Specifically, if the conservation measures are not implemented, or if the current anticipated level of habitat loss is exceeded, we fully expect the level of incidental take to increase as well. Hence, we will monitor the level of incidental take (1) using the number of acres, and (2) by monitoring the implementation and effectiveness of key conservation measures as indicated in the Terms and Conditions below.

**Table 3.** Anticipated number of acres of habitat loss within each Ohio management unit

<b>MANAGEMENT UNIT</b>	<b>ACRES</b>
West	1,565 acres
Central	2,280 acres
South	4,679 acres
Northeast	6,370 acres
East	7,224 acres
<b>Statewide</b>	<b>22,118 acres</b>

PC3 projects are the only projects anticipated to result in adverse effects to Indiana bats. ODOT anticipates that up to 22,118 acres of suitable Indiana bat habitat will be removed due to PC1, PC2, and PC3 projects combined over the next 5 years. At this time there is no estimate of the amount of habitat that may be removed by PC3 projects alone. PC1 and PC2 projects involve only minimal tree removal. The following estimates assume that the entire 22,118 acres will be removed for PC3 projects. The amount of incidental take anticipated for each management unit is identified in Table 3.

**EFFECT OF THE TAKE**

In the accompanying Biological Opinion, the Service determined that, based on the proposed project and full implementation of the conservation measures described on pages 10-12 of this biological opinion, 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**

As described above, the level of take that occurs is greatly influence by the implementation of the proposed conservation measures. To minimize incidental take to maximum extent feasible, we

believe the following reasonable and prudent measures are necessary and appropriate:

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

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

## **TERMS AND CONDITIONS**

In order to be exempt from the prohibitions of section 9 of the Act, FHWA and ODOT must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

### *Terms & Conditions Associated with RPM #1*

1. ODOT will prepare an annual report detailing all conservation measures, mitigation efforts, and monitoring that have been initiated, are ongoing, or completed during the previous calendar year and the current status of those yet to be completed. The report will be submitted to the Service's Reynoldsburg, Ohio Field Office by 31 January each year (the first report will be due 1/31/08) and reporting will continue through 2012 with the final report due no later than 1/31/2013 or until otherwise agreed to with the Service.

### *Terms & Conditions Associated with RPM #2*

2. To monitor the level of incidental take, ODOT will track and report to the Service via ODOT's Tier 2 consultation letter:
  - a. The number of projects thus far that entailed removal of potential roost trees between April 15 and September 15,
  - b. Whether the proposed project will entail removal of a potential maternity roost tree between April 15 and September 15,
  - c. Whether the proposed project will entail removal of any potential roost or potential maternity roost trees within 5 miles of a known or suspected hibernaculum between March 15 and November 15, and
  - d. The number of acres impacted thus far and the number of acres of habitat that will be impacted as part of the proposed Tier 2 project (This will be delegated to the ODOT funded USFWS Transportation Liaison in the Reynoldsburg, Ohio Field Office. Should ODOT choose to discontinue funding of this position, responsibility of tracking take will revert back to ODOT).

If any one of the following occurs, ODOT and FHWA will promptly reinstate consultation with the Service:

- i. If more than 5 projects will entail removing roost trees between April 15 and September 15;
  - ii. If a potential maternity roost will be removed between April 15 and September 15;
  - iii. If a roost tree within 5 miles of a known or suspected hibernaculum will be removed between March 15 and November 15; OR
  - iv. If habitat removal exceeds 1565 acres in the West Unit, 2280 in the Central Unit, 4679 acres in the South Unit, 6370 in the Northeast Unit, or 7224 acres in the East Unit.
3. Any dead bats located within a project area, regardless of species, should be immediately reported to ROFO [(614) 469-6923], and subsequently transported (frozen or on ice) to ROFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to ROFO. ROFO will make a species determination on any dead or moribund bats.

In conclusion, the Service believes that implementation of ODOT's Statewide Transportation Program through January 2012 will result in the injury or death of no more than 75 Indiana bats and the permanent loss of 22,148 acres of summer roosting and foraging habitat for the Indiana bat throughout the State of Ohio. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

### **REINITIATION NOTICE**

This concludes tier I formal consultation with FHWA on the implementation of ODOT's Statewide Transportation Program through January 2012. 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.

## 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. Provide funding to staff a permanent full-time Indiana bat Transportation Liaison within the Service's Reynoldsburg, Ohio Ecological Services Field Office (ROFO).
2. 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.

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**APPENDIX A**

Ohio Department of Transportation  
Ohio Habitat Assessment Form (OHAF)  
for the Indiana bat

**Indiana Bat Ohio Habitat Assessment Form (OHAF) for ODOT/USFWS use only  
to be used in conjunction with Indiana bat Programmatic Consultation, July 2006**

**Project Name/Number:** \_\_\_\_\_

**Prepared By:** \_\_\_\_\_ **Date of Assessment:** \_\_\_\_\_

**Lat/Long coordinates approx. center of project: Decimal degrees, 5 decimal places (example 42.78963)**

**Latitude:** \_\_\_\_\_ **Longitude:** \_\_\_\_\_

**Indiana bat Management Unit that Project primarily occurs in:**                      W unit                      S unit                      C unit                      E unit                      NE unit

**Section 1 ( Programmatic Consultation Tier 1)  
to be used in conjunction with Indiana bat Programmatic Consultation, July 2006**

**1. Will any portion of project occur outside of the defined urban areas (GIS layer)?**

- NO Project will have NO EFFECT on the Indiana bat and documentation filed at ODOT
- YES Continue to #2.

**2. Will any portion of project occur within 0.5 mile of a known or suspected hibernaculum?**

- NO Continue to #3
- YES Project MAY AFFECT the Indiana bat, follow Conservation Measure A-3 (Send Documentation to USFWS) and continue to #3

**3. Will project clear any potential Indiana bat roost trees?**

Roost trees are living trees (>8 inch dbh), standing dead trees or snags (trees with less than 10% live canopy) with exfoliating, peeling or loose bark, split trunks and/or branches, or cavities.

- NO Project will have NO EFFECT on the Indiana bat, documentation filed at ODOT (Unless answered yes on #2, then Project MAY AFFECT the Indiana bat, follow Conservation Measure A-3 (Send Documentation to USFWS) and continue to #4 );
- YES Project MAY AFFECT the Indiana bat, continue to #5

**4. Is the project within 5 miles of a known hibernaculum?**

- No Continue to #5.
- Yes Project LIKELY TO AFFECT the Indiana bat, Continue to Tier 2 ( Section 2: Part One)

**5. Is the project located between 5 and 10 miles of a hibernaculum?**

- No Continue to #6.
- Yes Project MAY AFFECT the Indiana bat, follow Conservation Measure A-3 (Send Documentation to USFWS) Continue to #6.

**6. Are all of the potential roost trees isolated?**

- NO Continue to #7
- YES Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, send this OHAF documentation to USFWS for concurrence (seasonal cutting required if impacts do not meet PC1-a or PC1-b, or if any isolated maternity roost trees are being removed)

**7. Are any of the identified potential roost trees potential maternity roost trees?**

(Trees >16 inch dbh, with some solar exposure; if not known, assume yes)

NO Continue to #9

YES Continue to #8

**8. Are all of the identified potential maternity roost trees isolated?**

No Project LIKELY TO AFFECT the Indiana bat, Continue to Tier 2 ( Section 2; Part one)

YES Continue to #9.

**9. Will project occur in W or C management unit?**

NO Continue to #10

YES Skip 10 & 11, continue to #12

**10. Will project remove more than 20 potential roost trees?**

NO Continue to #11

YES Project LIKELY TO AFFECT the Indiana bat, Continue to Tier 2 (Section 2; Part One)

**11. Will project occur within 5 miles of an Indiana bat capture record (including hibernacula records)?**

NO Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF & project documentation to USFWS for concurrence.

YES Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF & project documentation to USFWS and follow Conservation Measure A-1

**12. Will project remove more than 10 potential roost trees?**

NO Continue to #13

YES Project LIKELY TO aFFECT the Indiana bat, Continue to Tier 2 (Section 2; Part One)

**13. Will project occur within 5 miles of an Indiana bat capture record (including hibernacula records)?**

NO Continue to #14

YES Skip #14 & #15, Continue to #16.

**14. Is the project area (that contains the potential roost trees) within a forest area of less than 100 acres, or connected to a forest area of less than 100 acres via a tree line (row of trees 2 or more wide)?**

NO Continue to #15

YES Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF documentation to USFWS for concurrence.

**15. Is there a perennial water source within 0.5 mile of potential roost trees (that are within a forest area of more than 100 acres)?**

NO Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF documentation to USFWS for concurrence.

YES Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF documentation to USFWS for concurrence; follow Conservation Measure A-1



**16. Will project occur in W management unit?**

NO Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF documentation to USFWS for concurrence; follow Conservation Measure A-1

YES Continue to #17

**17. Is the project area (that contains the potential roost trees) within a forest area of less than 100 acres, or connected to a forest area of less than 100 acres via a tree line (row of trees 2 or more wide)?**

NO Skip #18, Continue to #19

YES Continue to #18

**18. Will the project remove all, or a portion of, a potential Indiana bat travel corridor?**

NO Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF documentation to USFWS for concurrence; follow Conservation Measure A-1

YES Project LIKELY TO AFFECT the Indiana bat Continue to Tier 2 (Section 2; Part One)

**19. Will the project remove more than 10% of the forest area it is within (or connected to)?**

NO Continue to #20

YES Project LIKELY TO AFFECT Indian bat, Continue to Tier 2 (Section 2; Part One)

**20. Will the project remove all, or a portion of, a potential Indiana bat travel corridor?**

NO Project MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT the Indiana bat, Submit OHAF and/or NLAA documentation to USFWS for concurrence; follow Conservation Measure A-1

YES Project LIKELY TO EFFECT Indian bat, Continue to Tier 2 (Section 2; Part One)

December 11, 2006 TW, AZ, USFWS & ODOT

**Section 2 ( Programmatic Consultation Tier 2)**  
**Indiana Bat Ohio Habitat Assessment Form (OHAF) for ODOT/USFWS use only**  
**to be used in conjunction with Indiana bat Programmatic Consultation, July 2006**

**Part 1**

**Option 1: Assume presence (higher take in S, E, NE units)**

- NO Continue to #2 or #3
- YES LIKELY TO ADVERSELY AFFECT; Submit Tier 2 information to USFWS and follow applicable seasonal tree cutting date restrictions. If seasonal cutting dates can not be followed and the project only involves the removal of potential roost trees and isolated potential maternity roost trees, request incidental take through Tier 2 submission. Follow Conservation Measures in PC to minimize adverse effects and mitigate by Management Unit (acre to acre). If seasonal cutting dates can not be followed and the project involves the removal of any non-isolated maternity roost trees, must answer no to Option #1 and continue with Options #2 and/or #3.

**Option 2: Conduct emergence survey (one or few trees). Were bats observed during the survey?**

- NO MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT; Submit Tier 2 information to USFWS and if in S, E, or NE units, follow seasonal tree cutting dates. No seasonal cutting restrictions necessary in W or C units (unless otherwise noted in Tier 1). If appropriate seasonal cutting dates can not be followed request incidental take through Tier 2 submission.
- YES Choose Option # 1 or Option # 3 (if the seasonal tree cutting date restrictions can not be followed and the project will involve the removal of any non-isolated potential maternity roost trees, Option # 3 must be selected).

**Option 3: Conduct mist net survey (in coordination with USFWS). Were Indiana bats caught during the survey?**

- NO MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT; Submit Tier 2 information to USFWS and if in S, E, or NE units, follow seasonal tree cutting dates. No seasonal cutting restrictions necessary in W or C units (unless otherwise noted in Tier 1). If appropriate seasonal cutting dates can not be followed request incidental take through Tier 2 submission.
- YES LIKELY TO ADVERSELY AFFECT; Continue to Part 2

**Part 2**

**1. Are Indiana bats caught that show signs of reproduction? (Female and juvenile Indiana bats only)**

- NO Submit Tier 2 information, send to USFWS with the following conservation measures applied from the PC: A-1, and one or more of measures M-1, M-2, M-3, and M-4.
- YES Coordinate with USFWS to choose measures that would be appropriate for minimizing harm to the maternity colony.

December 11, 2006 TW, AZ, USFWS & ODOT