United States Department of the Interior

FISH AND WILDLIFE SERVICE
East Lansing Field Office (ES)
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823-6316

IN REPLY REFER TO:

May 7, 2015

Jeffrey Kimble
Federal On-Scene Coordinator
U.S. Environmental Protection Agency
77 West Jackson Boulevard (SE-5J)
Chicago, Illinois 60604-3507

Re: Formal Section 7 Consultation for the Kalamazoo River Oil Spill Response, Log No. 15-R3-ELFO-01

Dear Mr. Kimble:

This document transmits the U.S. Fish and Wildlife Service's (Service) Emergency Biological Opinion (Opinion) for the Kalamazoo River Oil Spill Response and its effects on Indiana bat (*Myotis sodalis*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended. We received your request for formal consultation on December 9, 2014.

We base this Opinion on information provided in several documents, including the EPA's biological evaluation. Other information was provided via meetings, telephone conversations, and e-mails with EPA staff. A complete administrative record of this consultation is on file at the Service's East Lansing Field Office (ELFO).

We appreciate the opportunity to cooperate with the U.S. Environmental Protection Agency in conserving endangered species. If you have any questions regarding this consultation, please contact Ms. Barbara Hosler of this office at (517) 351-6326 or barbara_hosler@fws.gov.

Sincerely,

Acting for

Scott Hicks
Field Supervisor

cc: Jennifer Szymanski, FWS, Onalaska, WI

EMERGENCY BIOLOGICAL OPINION

For The

KALAMAZOO RIVER OIL SPILL RESPONSE

Submitted to:

U.S. Environmental Protection Agency Region 5
77 W. Jackson Boulevard
Chicago, Illinois 60604

Prepared by:

U.S. Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823

Introduction

This document transmits the U.S. Fish and Wildlife Service's (Service) Emergency Biological Opinion (Opinion) on the Kalamazoo River Oil Spill Response in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended. The U.S. Environmental Protection Agency (EPA) determined that its response to the oil spill adversely affected the Indiana bat (*Myotis sodalis*). After receiving EPA's request for emergency consultation on July 29, 2010, we received the EPA's request for initiation of formal consultation on December 9, 2014.

We base this Opinion on information provided in several documents, including the EPA's biological evaluation. Other information was provided via meetings, telephone conversations, and e-mails with EPA staff. A complete administrative record of this consultation is on file at the Service's East Lansing Field Office (ELFO).

Consultation History

July 29, 2010	EPA requested emergency consultation with the ELFO for actions in response to the Kalamazoo oil spill, which began on July 26, 2010.
July 30, 2010	The Service concluded that EPA's actions would affect Indiana bat but not jeopardize the species. The Service requested that EPA initiate consultation once their response to the spill had concluded.
February 7, 2014	EPA provided ELFO with a draft consultation letter and supporting materials for review.
June 8, 2014	The Service met with EPA to discuss the effects of response activities on Indiana bat.
July 3, 2014	The Service met with EPA to review maps of locations of tree removals that occurred as part of oil spill response activities.
December 9, 2014	EPA requested initiation of formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF THE ACTION

Action Area

On July 26, 2010, the National Response Center received a call from Enbridge Energy Partners, L.P. (Enbridge), notifying it of a crude oil discharge. The source of the discharge was a rupture of pipeline 6B adjacent to Talmadge Creek in Marshall, Michigan. Enbridge estimated the pipeline had discharged over 819,000 gallons of crude oil (later revised to 843,000 gallons) into Kalamazoo River, by way of Talmadge Creek, a tributary to Kalamazoo River, and onto the adjoining shorelines of Talmadge Creek and Kalamazoo River. The discharge occurred during a high-water event that carried oil nearly 40 miles downstream to Morrow Lake and Ceresco Dam.

Emergency Response

On July 27, 2010, the EPA issued Enbridge an initial order pursuant to Section 311 (c) of the Clean Water Act, which required Enbridge to abate the discharge of oil to waters of the United States by performing removal actions in response to the discharge of oil from the pipeline into Kalamazoo River by way of Talmadge Creek. On August, 8, 2010, Unified Command issued a memo to the EPA Region 5 Administrator stating that the response had moved from an emergency response action to a recovery and remediation operation; however, EPA continued to treat this site as an emergency under the Oil Pollution Act. For the purposes of this consultation, the emergency response period covers all response activities conducted under EPA's oversight from July 26, 2010, to July 14, 2011, when the Michigan Department of Environmental Quality issued the first permit for response activities.

Response actions required the development of staging areas and haul roads and the removal of impacted soil and debris. In total, there were 236 impacted areas and subsequent response actions during the time period under this consultation. Of those areas, 72 were access areas, 122 were staging areas, and 42 were excavation areas. These areas total approximately 250 acres. By reviewing pre-spill aerial maps, EPA determined approximately 150 of these acres were forested.

The following represents types of activities that may have occurred in these impacted areas:

- Access improvement including temporary road construction, some vegetation and possible tree removal;
- Excavation of soil utilizing heavy equipment or manual digging methods (typically not greater than 2 feet deep);
- Dewatering, water treatment, and discharge utilizing granular activated carbon (GAC) system;
- Solidification of excavated wet soils, including addition and mixing of sawdust with wet soils;
- Site restoration, including backfilling excavations, grading, seeding, and erosion control; and
- Demobilization, including decommissioning of temporary access roads (if appropriate).

Enbridge, at the direction of EPA, collected data on all trees removed during the response. Indiana bat potential roost trees were identified, tabulated, and mapped. In the time period covered by this

consultation, 953 trees were removed; of these, 662 were removed during April 1 to October 1 when Indiana bats may have been present. Trees that were less than 3 inches diameter at breast height (dbh) were excluded from this list.

Throughout the emergency response, the EPA implemented conservation measures to avoid or minimize adverse effects to Indiana bats. These conservation measures included: accessing work areas by waterway whenever possible to avoid constructing haul roads and designing and constructing haul roads to minimize tree removal when work areas were accessible only by land. Some work activities were conducted during October to April when bats would not be present in summer breeding habitat. In some situations, helicopters were used to remove impacted response equipment and resources from the river to avoid causing harm to the vegetation.

STATUS OF THE SPECIES

Species Description

The Indiana bat is a medium-sized insectivorous bat in the *Myotis* genus with a head and body length that ranges from 41 to 49 mm [1.6 to 1.9 inches (in)]. The Indiana bat closely resembles the little brown bat (*Myotis lucifugus*) but is distinguished from this species by its shortened toe hairs and a slightly keeled calcar.

The species' range includes much of the eastern half of the United States from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. The Indiana bat is migratory, with the above described range including both winter and summer habitat. The winter range is associated with regions of well-developed limestone caverns. Major populations of this species hibernate in Indiana, Kentucky, and Missouri. Smaller winter populations have been reported from Alabama, Arkansas, Georgia, Illinois, Maryland, Michigan, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia.

The Indiana bat was 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]). In 1973, the Endangered Species Preservation Act was subsumed by the ESA, and the Indiana bat was extended full protection under this law. Thirteen hibernacula (11 caves and two mines) in six states were designated as critical habitat for the Indiana bat on September 24, 1976 (41 FR 41914).

The Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USFWS 2007) updated the original recovery plan from 1983 and provides the most current information on the status of the population recovery goals and recovery strategy. The recovery program for this species has four broad components: 1) range-wide population monitoring at the hibernacula with improvements in census techniques; 2) conservation and management of habitat (hibernacula, swarming, and to a degree, summer); 3) further research into the requirements of and threats to the species; and 4) public education and outreach (USFWS 2007).

The recovery program for the Indiana bat delineates four Recovery Units (RUs): the Ozark-Central, Midwest, Appalachian Mountains, and Northeast RUs (Figure 1). Recovery Units serve to protect both

core and peripheral populations and ensure that the principles of representation, redundancy, and resiliency are incorporated (USFWS 2007).

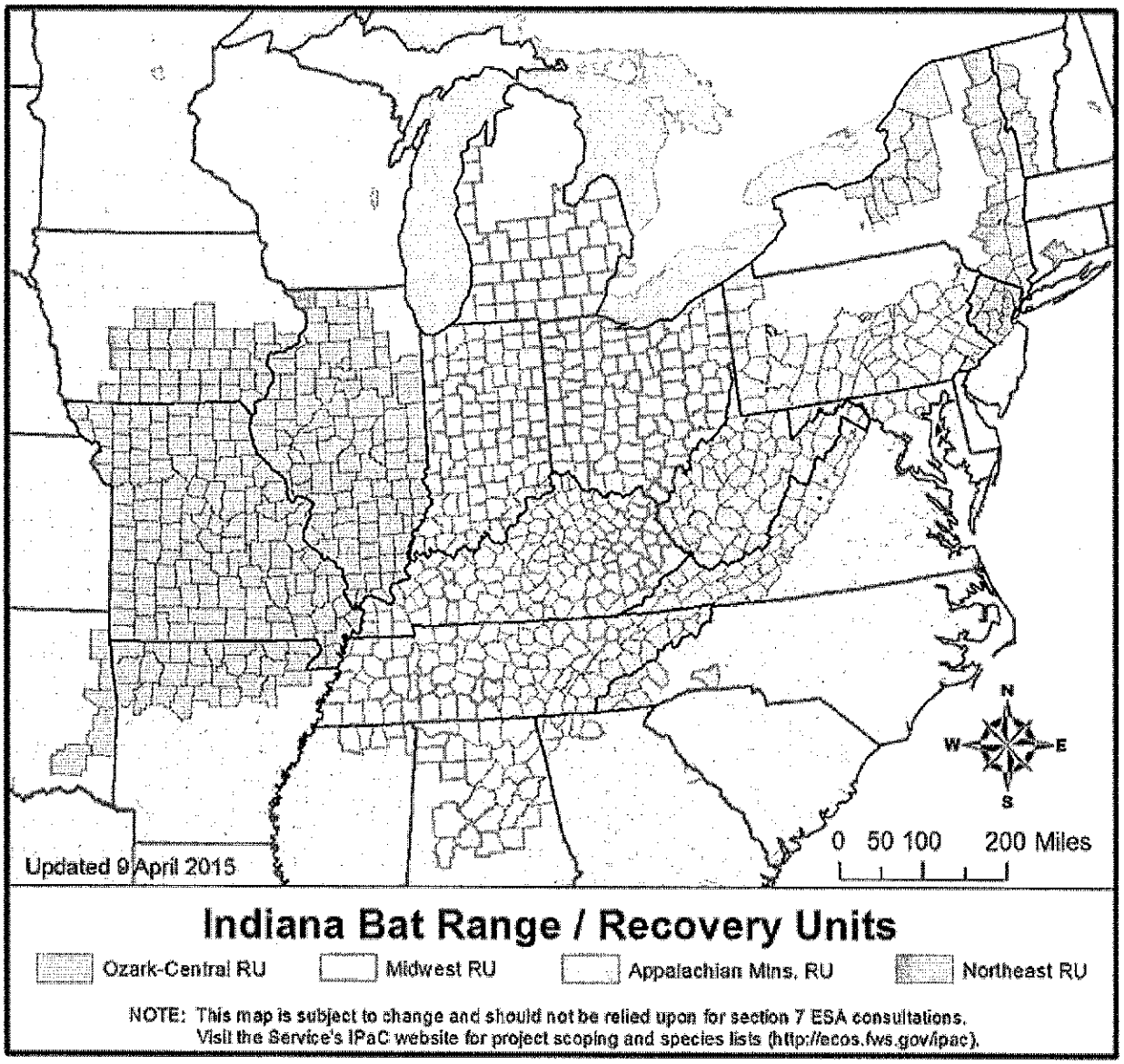


Figure 1. Indiana Bat Recovery Units.

Life History

In the winter, the Indiana bat hibernates in caves and mines, often with other species of bats, from the months of October through April although the period of hibernation varies across the range of the species, among years, and among individuals. Indiana bats, especially females, are philopatric, meaning they return annually to the same hibernacula (LaVal and LaVal 1980). Most Indiana bats hibernate in caves or mines where the ambient temperature remains below 10°C (50.0°F) but infrequently drops below freezing (Hall 1962, Myers 1964, Henshaw 1965, Humphrey 1978).

In spring, Indiana bats emerge from hibernation. The timing of annual emergence varies across the range, depending on latitude and weather (Hall 1962). Females tend to emerge first, usually from late March to mid-April. Males usually exit by the beginning of May.

Shortly after emerging from hibernation, females become pregnant via delayed fertilization from the sperm that has been stored in their reproductive tracts through the winter. Most reproductive females leave immediately for summer habitat although some may linger for a few days near the hibernaculum. Males and non-reproductive females may stay near hibernacula or travel to summer habitat. Indiana bats can migrate hundreds of kilometers from their hibernacula (USFWS 2007). In the Midwest RU, the maximum documented migratory distance is 574.5 km (357 mi) (Winhold and Kurta 2006).

After arriving at their summer range, female Indiana bats form maternity colonies where they bear and raise their pups. Members of the same maternity colony exhibit strong site fidelity to summer roosting and foraging areas and will return to the same summer range annually. Most documented maternity colonies have 50 to 100 adult female bats; colony size averages approximately 80 adult females (Whitaker and Brack 2002).

Maternity colony habitats include riparian, bottomland and floodplain forests, wooded wetlands, and upland forest communities. Maternity roost sites are most often under the exfoliating bark of dead trees although live trees, especially shagbark hickory, are also used if they have flaking bark under which the bats can roost. Maternity colonies typically use 10 to 20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (Callahan 1993, Callahan *et al.* 1997). Roost trees can vary considerably in size, but primary roosts are usually large diameter snags (dead trees). Although male Indiana bats may roost in trees less than12.7 cm (5 in) dbh, suitable roosting habitat is defined as forest patches with trees of 12.7 cm (5 in) dbh or larger (USFWS 2015). Although roost trees are often in mature mostly closed-canopy forests, maternity roost trees, especially in southern Michigan, are typically in open areas exposed to solar radiation (i.e., sunlight on the roost area for at least part of the day). These trees may be in canopy gaps in the forest, in a fence line, or along a wooded edge. Roost trees, although ephemeral in nature, may be occupied by a colony for a number of years until they are no longer suitable.

Indiana bats eat a variety of flying insects found along rivers or lakes and in uplands. Indiana bats typically forage within 2.5 miles from roost trees. When the locations of roost trees are unknown, the home range for a maternity colony is considered to be all suitable habitat within 5 miles from capture points (USFWS 2011).

Female Indiana bats give birth to one young each year (Mumford and Calvert 1960, Humphrey *et al.* 1977, Thomson 1982). Most births occur in mid- to late June and lactation continues into July for 3 to 5 weeks (Kurta and Rice 2002). Young bats can fly at about four weeks of age after which maternity colonies begin disbanding. A few bats from maternity colonies may commence fall migration in August, although at many sites some bats remain in their maternity colony area through September and even into October (Humphrey *et al.* 1977, Kurta *et al.* 1993). Members of a maternity colony do not necessarily hibernate in the same hibernacula (Kurta and Murray 2002).

Upon arrival at hibernacula, Indiana bats mate and build up fat reserves by foraging, usually in close proximity to the cave. This period of activity prior to hibernation is called swarming, which is a critical

part of the life cycle when Indiana bats converge at hibernacula, mate, and forage until sufficient fat reserves have been deposited to sustain them through the winter (Hall 1962). Swarming behavior typically involves large numbers of bats flying in and out of cave entrances throughout the night, while most of the bats continue to roost in trees during the day.

Indiana bats arrive at their hibernacula in preparation for mating and hibernation as early as late July; usually adult males or non-reproductive females make up most of the early arrivals (Brack 1983). The number of Indiana bats active at hibernacula increases through August and peaks in September and early October (Cope and Humphrey 1977, Hawkins and Brack 2004, Hawkins *et al.* 2005). Swarming continues for several weeks and mating may occur on cave ceilings or near the cave entrance during the latter part of the period. After fall migration, females typically do not remain active outside the hibernaculum as long as males. Males may continue swarming through October in what is believed to be an attempt to breed with late arriving females.

Limited mating activity occurs throughout the winter and in spring before the bats leave hibernation (Hall 1962). Young female bats can mate in their first autumn and have offspring the following year (although how many actually do so is variable), whereas males may not mature until the second year.

A generalized chronology of the annual cycle in Indiana bats is found in Figure 2. Note that this figure depicts peaks for each phase of annual chronology but does not capture outliers.

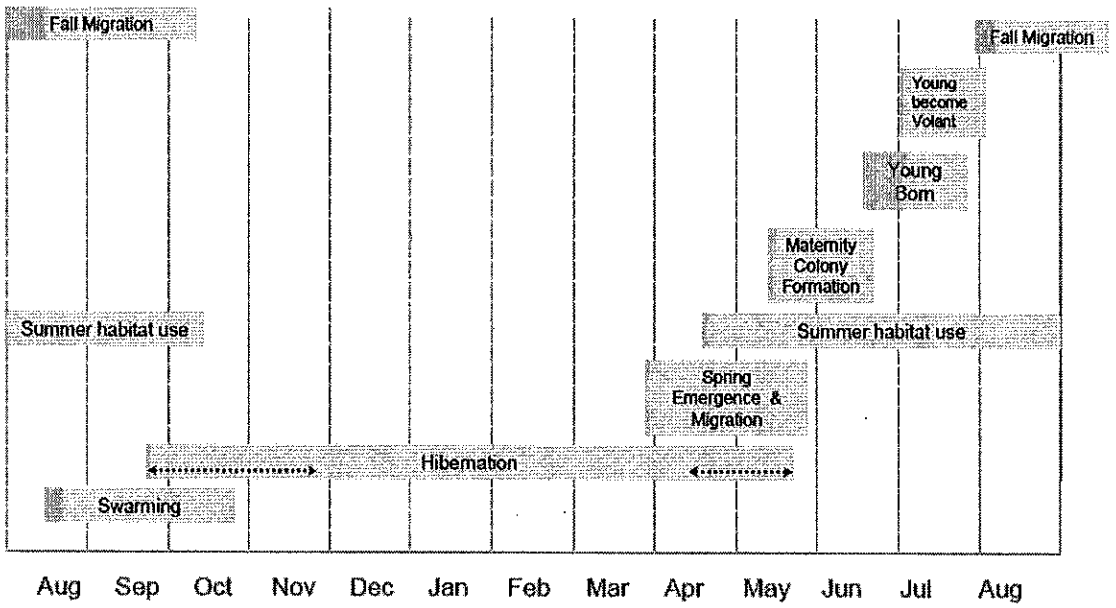


Figure 2. Annual life cycle of Indiana bat.

Population Status and Distribution

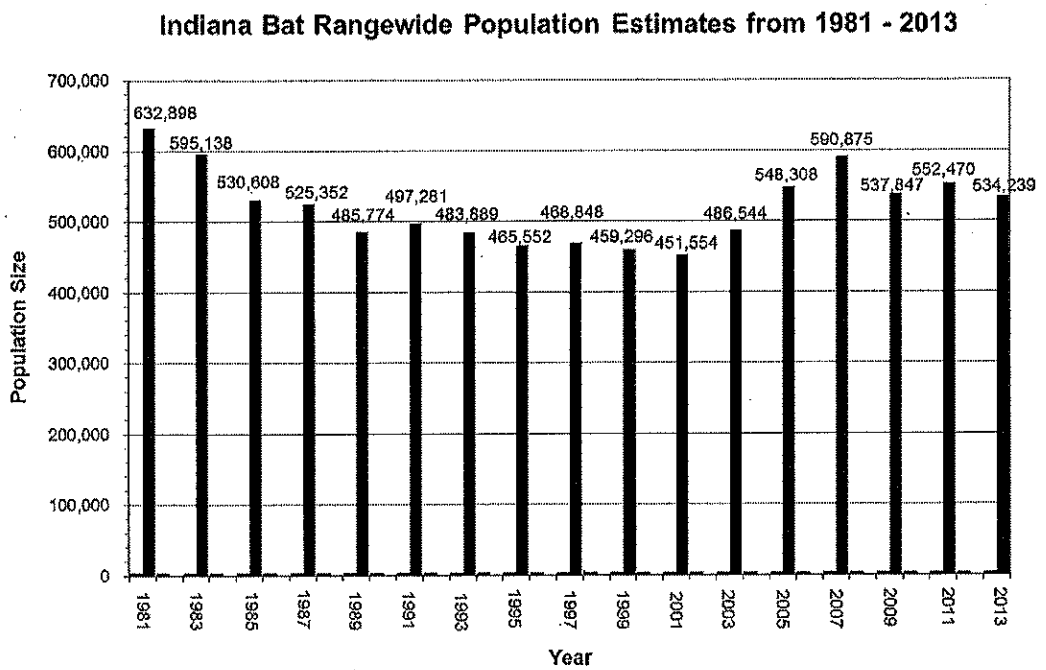
Range-wide Trend

From 1965 to 2001, there was an overall decline in the range-wide population of the Indiana bat (USFWS 2007). Despite the discovery of many new, large hibernacula during this time, the range-wide

population estimate dropped approximately 57% from 1965 to 2001. Contrary to the apparent long-term trend of decreasing population numbers of Indiana bats, the estimated range-wide population increased from 328,526 Indiana bats in 2001 to 467,947 Indiana bats in 2007 (USFWS 2013). The first observed Indiana bat range-wide decline since 2001 was documented from 2007 to 2009 when the overall Indiana bat population declined by approximately 11% (i.e., loss of approximately 52,435 Indiana bats) (USFWS 2013).

The 2013 range-wide population estimate of Indiana bats was 534,239 individuals, based on winter hibernacula survey information compiled by the Service. In 2013, more than 40% of Indiana bats (226,365 of 534,239) hibernated in caves in southern Indiana. Illinois, Missouri, and Kentucky supported populations of over 50,000 hibernating Indiana bats. Other states within the current winter range of the Indiana bat include Alabama, Arkansas, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia. Approximately 56% of the population hibernated in the Midwest Recovery Unit. Based on 2013 data, five caves and two mines had 20,000 or more hibernating bats. Collectively, these seven sites contain 73% of the range-wide population. The 2013 population estimate (534,239) is almost 400,000 bats less than when the species was listed as endangered in 1967 (approximately 900,000).

Figure 3 provides the range-wide Indiana bat population estimates from 1981-2013. Biennial winter surveys for the Indiana bat were conducted in January and February of 2015, but not all states have reported their findings.



Andy King, U.S. Fish and Wildlife Service, Bloomington, Indiana. Revised 8-26-2013

Figure 3. Indiana bat rangewide population estimates, 1981-2013.

Threats to the Species

The Indiana bat was one of 78 species first listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 because of large decreases in population size and an apparent lack of winter habitat (32 FR 4001). Although that listing document did not address the five-factor threats analysis later required by section 4 of the ESA, the draft revised Recovery Plan (USFWS 2007) includes a detailed discussion of threats. The following summarizes information from the draft revised recovery plan and incorporates new information about emerging threats.

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

Destruction/Degradation of Hibernation Habitat

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

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

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

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

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

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

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

Disturbance of Hibernating Bats

The original recovery plan for the species stated that human disturbance of hibernating Indiana bats was one of the primary threats to the species (USFWS 1983). The primary forms of human disturbance to hibernating bats result from cave commercialization (cave tours and other commercial uses of caves), recreational caving, vandalism, and research-related activities. Progress has been made in reducing the number of caves in which disturbance threatens hibernating Indiana bats, but the threat has not been eliminated.

Disturbance of Summering Bats

There are far fewer documented examples of disturbance of Indiana bats in summer due to "overutilization for commercial, recreational, scientific, or educational purposes," compared with impacts to hibernating bats. However, research-related disturbance and mortality from mist-netting and associated handling of bats has been observed (USFWS 2007). Insuring that only qualified, permitted researchers conduct this work and follow proper holding and marking techniques minimizes potential for research-related mortality.

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

Factor C. Disease or Predation

In the past, disease and predation have generally not been considered major threats to Indiana bats (USFWS 2007). The emergence of white-nose syndrome (WNS) has caused recent catastrophic

declines among multiple species of bats in eastern North America (Lorch *et al.* 2011, Cryan *et al.* 2013a) and presents a significant threat to Indiana bat populations (Turner *et al.* 2011).

WNS is a condition affecting primarily hibernating bats. Dead bats were first documented at four sites in eastern New York in the winter of 2006-2007. At the time, the cause of mortality was unknown. A white fungus was observed on the muzzles of many of the dead bats, and the term "white-nose syndrome" was coined. WNS has since caused the death of an estimated 5.7 – 6.7 million bats of seven species, including the Indiana bat, across the eastern North America. Bat population declines due to WNS are one of the fastest declines of wild mammal populations ever observed (Cryan *et al.* 2010; Frick *et al.* 2010). At the end of the 2014-2015 hibernating season, bats with WNS were confirmed in 26 states and five Canadian provinces.

The fungus associated with WNS was initially identified as *Geomyces destructans*, a previously undescribed species (Gargas *et al.* 2009). More recent phylogenetic analyses have led to reclassification of the WNS fungus as *Pseudogymnoascus destructans* (Minnis and Lindner 2013). The fungus invades living tissue, causing cup-like epidermal erosions and ulcers (Meteyer *et al.* 2009, Puechmaille *et al.* 2010). These erosions and ulcers may in turn disrupt the many important physiological functions that wing membranes provide, such as water balance (Cryan *et al.* 2010). The fungus thrives in the cold and humid conditions of bat hibernacula, and it is believed that WNS is transmitted primarily through bat-to-bat contact.

Some affected bats display abnormal behavior, including flying during the day and in cold weather (before insects are available for foraging) and roosting towards a cave's entrance where temperatures are much colder and less stable, and many infected bats do not survive the winter. The exact processes by which the fungal skin infection leads to death are not known, but depleted fat reserves (i.e., starvation) contribute to mortality (Reeder *et al.* 2012, Warnecke *et al.* 2012) and dehydration may also play a role (Willis *et al.* 2011, Cryan *et al.* 2013b, Ehlman *et al.* 2013). It is also suspected that some of the affected bats that survive hibernation emerge in such poor condition that they do not survive the summer. Among those bats that do survive, productivity of female survivors may be negatively affected (Francl *et al.* 2012).

The Northeast Recovery Unit, where WNS was first observed in the winter of 2006-2007, lost almost 70% of its Indiana bats between 2007 and 2013 (USFWS 2013). Between 2011 and 2013, the Appalachian Recovery Unit, where WNS was confirmed in the winter of 2008-2009, declined by 46%. The Midwest Recovery Unit, where WNS was confirmed in the winter of 2010-2011, declined by 2.5%. The Ozark-Central Recovery Unit, where WNS was confirmed in the winter of 2011-2012, had not yet experienced declines by 2013. Based on these observations of WNS spread, it appears that the arrival of the fungus in an area may precede large-scale fatality of bats by several years.

Thogmartin *et al.* (2012) suggested that all hibernating populations of Indiana bats are currently susceptible to WNS; throughout the range of the species, infected source populations are within the known migration distance for individual Indiana bats. Models of the impacts of WNS on Indiana bat populations suggest that WNS will cause local and regional extirpation of some wintering populations of Indiana bats and overall population declines exceeding 86% (Thogmartin *et al.* 2013). Ultimately, how WNS will impact Indiana bat populations in the long term is not known, although current data suggest that those impacts will be severe. Based on observations in the Northeast, the area that has

been affected the longest and has the best data on mortality, we anticipate that all RUs will eventually experience the level of decline that has been documented in the Northeast.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Listing of the Indiana bat in 1967 under the Endangered Species Preservation Act and the subsequent listing under the ESA in 1973 brought attention to the dramatic declines in the species' populations and led to regulatory and voluntary measures to alleviate disturbance of hibernating bats (Greenhall 1973). The Federal Cave Resources Protection Act of 1988 (18 U.S.C. 4301-4309; 102 Stat. 4546) was passed to "secure, protect, and preserve significant caves on Federal land" and to "foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, educational, or recreational purposes."

When protected under the ESA, the Indiana bat was listed by only two states (Martin 1973). The Indiana bat is now protected under state endangered species laws in 19 of 22 states where it currently occurs and in all states that make up the Midwest RU, including Michigan. Most state endangered species laws, however, limit protection to prohibitions against direct take and do not extend to protection of habitat. Local laws that regulate development in karst regions also help to protect areas surrounding caves and other karst features from inappropriate development, although local karst protection ordinances are not common within the species' range (Richardson 2003).

Generally, existing regulatory mechanisms are more effective at protecting Indiana bat hibernacula than summer habitat. Hibernacula are discrete and easily identified on the landscape, whereas summer habitat is more diffuse. Thus, the conservation value of protecting a hibernaculum is easier to demonstrate and quantify compared with the value of protecting summer habitat. Similarly, factors that affect hibernacula directly (e.g., construction of barriers in cave openings) are easier to identify, and thus regulate, compared with activities in the surrounding landscape that less directly affect hibernacula (e.g., land-use practices that lead to siltation in cave entrances).

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

Natural Factors

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

Environmental Contaminants

With the restrictions on the use of organochlorine pesticides in the 1970s, this significant threat to Indiana bats was reduced. However, cholinesterase-inhibiting insecticides, organophosphates, and carbamates have now become the most widely used insecticides (Grue *et al.* 1997), and the impact of these chemicals on Indiana bats is not known. Because of the unique physiology of bats in relation to reproduction, high energy demands and sophisticated thermoregulatory abilities, much more research

needs to be done with these pesticides and their effects on bats. These and other contaminants likely remain a significant but poorly understood threat to Indiana bats.

Climate Change

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

Collisions with Man-made Objects

Collisions of bats with man-made objects have not been fully evaluated, but concern for bat mortality related to such collisions is growing, specifically with reference to collisions with turbines at wind energy facilities. Several studies have assessed the impact of wind turbines on bats (Johnson 2005, Kunz *et al.* 2007, Arnett *et al.* 2008, Hayes 2013, and Smallwood 2013). Kunz *et al.* (2007) reported that of the 45 species of bats that are found in North America, 11 had been recorded among the mortalities at wind energy facilities; migratory tree-roosting bats within the genera *Lasiurus* and *Lasionycteris*, especially hoary bats (*Lasiurus cinereus*) and eastern red bats (*Lasiurus borealis*), form a large proportion of the bats killed. Most bat fatalities at turbines occur during late summer and autumn (Johnson 2005, Kunz *et al.* 2007, Arnett *et al.* 2008), suggesting that bats may be particularly susceptible during fall migration. Generally, incomplete knowledge of the migratory behavior of bats limits our ability to understand and evaluate why bats strike wind turbines (Larkin 2006).

Bats may also suffer barotrauma, a phenomenon in which abrupt air pressure changes cause tissue damage to air-containing structures. The tympana (ear drums) of bats could potentially be affected by air pressure changes when bats fly in the near vicinity of wind turbine blades. Damage to the ear can result in impairment of hearing and echolocation abilities. The auditory system in bats has a major role in echolocation, which is critical to a bat's ability to find prey and to navigate while flying. Any significant impairment of hearing would have the potential to affect survival. Both Rollins *et al.* (2012) and Grodsky *et al.* (2011) examined the ears of bats killed at wind turbines, and both noted damage to the ears in some of the bats, although both noted difficulty in distinguishing damage caused by traumatic injuries (i.e., blunt force trauma caused by a turbine blade) versus barotrauma. So, while some bats that die at wind farms have injuries to the ear, it is not known to what extent there are also bats that fly near the blades and suffer damage, but are able to fly away.

The first known fatality of an Indiana bat at a wind facility occurred in northern Indiana in September 2009, and a second fatality was documented at the same site in September 2010. Since that time, there have been five additional known fatalities of Indiana bats at wind facilities throughout the range of the species (Pruitt and Okajima 2014). Five of the seven known fatalities to date appear to be associated with fall migration, while one occurred in July. In addition to fall migration, Indiana bats may be susceptible to wind turbine fatalities while on summer range and/or during spring migration.

While post-construction fatality monitoring is shedding light on bat mortality at wind turbines, sub-lethal interactions (i.e., a bat is injured but does not die) are poorly documented. There is also potential for delayed lethal effects after non-lethal contact with wind turbines (i.e., bats sustain injuries and die sometime later). These can result in underestimating bat mortality caused by wind energy facilities (Grodsky *et al.* 2011).

ENVIRONMENTAL BASELINE

Status of the Species within the Action Area

We do not have any records of Indiana bats occurring within the action area. However, at the east end of the action area, an active Indiana bat roost tree is approximately 7.5 miles north of the rupture site on Talmadge Creek. We also have records of a post-lactating female and juvenile male captured in the month of August, approximately 15.5 miles west of Ceresco Dam at the west end of the action area. Although roost trees were not documented, we can assume a maternity colony occurred within 5 miles of this capture location.

Other surveys conducted in the vicinity of the action area in 2005, however, did not detect Indiana bats. These sites included Fort Custer Training Center, which provides forested habitat within a mile of Kalamazoo River (Kurta and Foster 2005), Kellogg Forest, approximately 2.5 miles north of the river (Winhold 2007), and Augusta State Fish and Wildlife Area, 4 miles north of the river (Winhold 2007).

Additional large areas of forest remain in and around the action area, including Fort Custer State Recreation Area at more than 3,000 acres. As suitable habitat occurs throughout much of the area along Kalamazoo River, we expect that Indiana bats may use the forested areas within the action area for breeding and foraging. However, based on past survey efforts, we do not expect a high density of Indiana bats, if present, in the action area.

Factors Affecting the Species within the Action Area

Previous Section 7 Consultations

In 2007, the Kalamazoo County Road Commission widened the 35th Street Bridge over Kalamazoo River in Comstock Township from two lanes to five lanes, including bridge rehabilitation work. Trees were removed prior to April 1. We concurred that impacts to Indiana bat were unlikely.

Other natural and human-caused factors

Land uses in and surrounding the action area include agriculture, urban and suburban areas, a State-owned recreation area, and locally owned parks. Past and ongoing human and natural events in the area which could pose potential adverse effects to Indiana bat include tree clearing activities for development, agriculture, and recreational purposes.

EFFECTS OF THE ACTION

Direct Effects

We do not have any records of Indiana bats occurring within the action area; however, we know of two maternity colonies near the action area. One of these colonies is approximately 7.5 miles from the action area and the other is approximately 15.5 miles. Both of these are more than 5 miles from the action area and thus beyond a maternity colony's typical home range. Therefore, we do not expect that bats from these two colonies were in the action area during response activities, and no bats from these colonies were taken as a result of the response actions.

Because suitable habitat occurs in the action area, Indiana bats may have been present in the action area from April through September. According to the information from EPA, 662 trees greater than 3 inches dbh were removed during this time period (April 1 - September 30) subject to this consultation. Diameter of trees was not always recorded (approximately 303 trees), but are included on the list. Condition of these 662 trees—for example, presence of exfoliating bark, cavities, and /or crevices—was not noted.

We expect that many of these trees did not provide suitable conditions to serve as potential roost trees for a maternity colony of Indiana bats. Although male Indiana bats will roost in trees less than 5 inches dbh, maternity colonies do not occur in trees that small. Approximately, 138 trees were less than 5 inches dbh. Further, many of the removed trees were in partially developed/residential areas and agricultural areas. While these areas may provide foraging habitat and travel corridors, they are less likely to provide suitable roosting habitat for a maternity colony. Based on our analysis, we expect that no more than 125 of the trees removed from April 1- September 30 may have been potential maternity roost trees, given the right conditions (exfoliating bark, cavities, southern exposure, etc.). These trees occurred in eight staging areas, four access areas, and five excavation areas, totaling 32.6 acres.

We have no evidence to indicate these potential roost trees were occupied; however, if these trees were active roost trees, cutting during April to September may have directly affected Indiana bats by killing or injuring adult bats (male or female) although many adults may have been able to escape from trees before they were felled. Pups, however, are unable to fly for the first four weeks of life; therefore, any pups in trees that were removed likely died. The loss of active roost trees during the breeding season may disrupt normal behavioral patterns as bats shift roosting sites or search for replacement roosts. Further, the use of heavy machinery in the vicinity of roost trees may cause bats to abandon the roost. These effects could lead to reproductive failure for the maternity colony.

Indirect Effects

Indirect effects are caused by the proposed action but are later in time and reasonably certain to occur. During the time period of this consultation, 953 trees were removed and 150 acres of forest were impacted by the response actions. Because Indiana bats exhibit fidelity to breeding sites and roost trees, the loss of maternity roost trees may adversely affect future breeding efforts within the action area. But as discussed above, we do not expect that all of these trees or forests provided maternity habitat; much of it was likely foraging habitat or travel corridors. This acreage and the trees within it were not concentrated in one contiguous block of habitat, but rather were distributed along approximately 40 miles of Kalamazoo River and Talmadge Creek. In addition, large areas of forest remain in and around Kalamazoo River, including the Fort Custer State Recreation Area at more than 3,000 acres. The loss of 150 acres represents less than 5% of the remaining habitat available to Indiana bats in the area.

Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that will not be subject to section 7 consultation in the areas being considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not being considered in this biological opinion, since they would require a separate consultation pursuant to section 7(a)(2) of the ESA, as amended.

Although we are aware of no major non-Federal actions that are reasonably certain to occur in the action area, we may assume that some activities, particularly on private lands, could have an effect on the Indiana bat in the action area. Actions performed on private lands that may adversely affect the Indiana bat in the future include development and timber harvest.

Conclusion

Regulations define "jeopardize the continued existence of a species" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." We must analyze how the proposed action and potential effects could impact reproduction, number, and distribution of Indiana bat.

We do not expect that any bats from the two known maternity colonies near the action area were affected by the response action. We anticipate that up to 125 potential maternity roost trees were taken as a result of the oil spill response actions from July 26, 2010, to July 14, 2011. In addition, 150 acres of forest was impacted; however, the loss of this acreage is small (less than 5%) in comparison to the forested habitat available to Indiana bats in the area.

After reviewing the current status of Indiana bat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, we conclude that the proposed action was not likely to reduce reproduction, numbers, or distribution of Indiana bat to such an extent as to reduce appreciably the likelihood of survival and recovery of the species. It is the Service's biological opinion that the proposed action did not jeopardize the continued existence of Indiana bat. Critical habitat for the species does not occur in Michigan; therefore, none was affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA 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 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 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.

The EPA implemented several conservation measures to avoid or minimize adverse effects to Indiana bat habitat during their response to the emergency. These conservation measures included: accessing work areas by waterway whenever possible to avoid constructing haul roads, designing and constructing haul roads to minimize tree removal when work areas were accessible only by land, and conducting some work activities from October to April. Although these measures reduced the potential for take, a limited amount of take occurred as a result of the action.

Amount or Extent of Take Anticipated

Actions in response to the Enbridge oil spill resulted in the loss of 125 potential roost trees distributed across 32.6 acres. We expect take in the form of harm from the loss of 33 acres of potential roosting habitat.

Effect of Take

In the accompanying biological opinion, we determined that the proposed action did not appreciably reduce the likelihood of recovery or survival of Indiana bat. Therefore, we believe that the level of anticipated incidental take associated with the actions from the emergency response to the Enbridge oil spill did not jeopardize the Indiana bat.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA 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.

We offer the following conservation recommendations that the EPA can undertake to benefit Indiana bats in Michigan:

- Conduct surveys to assess the population status of Indiana bats within the action area.
- Develop appropriate Conservation Measures and Emergency Consultation procedures for future response actions to oil spills.
- Replant trees and restore forested habitat along Kalamazoo River and other sites within the action area.

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