Life History of the

NORTHERN LONG-EARED BAT *(Myotis septentrionalis)*

2 SPRING STAGING

3 SUMMER HABITAT

1 WINTER HIBERNATION

4 FALL SWARMING

DRAFT

INDIANA DEPARTMENT OF TRANSPORTATION

U.S. FISH & WILDLIFE SERVICE

U.S. Department of Transportation
Federal Highway Administration

Life History of the

NORTHERN LONG-EARED BAT *(Myotis septentrionalis)*

1 WINTER HIBERNATION

(October to Mid-March)

Caves and mines are used by the northern long-eared bat in winter. Hibernacula used are typically large, with large passages and entrances, relatively constant and cooler temperatures, and with high humidity and no air currents. The sites favored by them are often in very high humidity areas to such a large degree that droplets of water are often observed on their fur. They are typically found roosting in small crevices or cracks in cave or mine walls and can often be overlooked in surveys. To a lesser extent, they have been found overwintering in habitats that resemble caves or mines, such as abandoned railroad tunnels, storm sewers (Goehring 1954, p. 435), hydro-electric dams (Kurta and Teramino 1994, pp. 410-411), aqueducts (French 2012, unpublished data) or other "unsuspected retreats" where caves and mines are not present. Northern long-eared bats have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum. Other species in Indiana that commonly occupy the same hibernacula with the northern long-eared bat are the little brown bat, big brown bat, tri-colored bat, and Indiana bat. Northern long-eared bats often move between hibernacula throughout the winter, which may further decrease population estimates. Similarly, this species has been found to fly in and out of some of the mines and caves in southern Indiana throughout the winter (Whitaker and Mumford 2009, p. 210).

2 SPRING STAGING

(Mid-March to Mid-May)

Both males and females emerge from caves and mines in spring. Northern long-eared bats exhibit significant weight loss during hibernation. One Indiana study showed a 41-43% loss (Whitaker and Hamilton 1998, p. 101). During staging, northern long-eared bats are flying in and out of caves to feed and congregate around these caves before migrating to their summer homes. The northern long-eared bat is not considered a long-distance migratory species. Short migratory movements between summer roost and winter hibernacula are typically between 35 to 55 miles (Nagorsen and Brigham 1993, p. 88; Griffith 1945, p. 53). However, movements may range from 5 to 168 miles (Griffith 1945, p. 22). When females leave the cave, they are pregnant and on a mission to start a new generation in their summer home. Gestation is approximately 60 days (Kurta 1994, p. 71). Males are reproductively inactive until late July, with testes descending in most males during August and September (Caire et al. 1979, p. 407; Amelon and Burhans 2006, p. 69).

3 SUMMER HABITAT

(Mid-May to Mid-August)

During the summer, northern long-eared bats typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and non-reproductive females' summer roost sites may also include cooler locations, including caves and mines (Barbour and Davis 1969, p.77). They also have been found roosting in man-made structures, such as buildings, barns, a park pavilion, sheds, cabins, under eaves of buildings, behind window shutters, and in bat houses (Mumford and Cope 1964, p. 72; Barbour and Davis 1969, p. 77; Cope and Humphrey 1972, p. 9; Amelon and Burhans 2006, p. 72; Whitaker and Mumford 2009, p. 209; Timpone et al. 2010, p. 119; Joe Kath 2013, pers. comm.). This species appears to be somewhat opportunistic in roost selection. Canopy cover at northern long-eared bat roosts has ranged from 56% (Timpone et al. 2010, p. 118) to greater than 84% (Lacki and Schwierjohann 2001, p. 487). Females tend to roost in more open areas than males, likely due to the increased solar radiation, which aids in pup development (Perry and Thill 2007, p. 224). Roosts are also largely selected below the canopy, which could be due to the species' ability to exploit roosts in cluttered environments; their gleaning behavior suggests an ability to easily maneuver around obstacles (Foster and Kurta 1999, p. 669; Menzel et al. 2002, p. 112). One study found that northern long-eared bats roost more often on upper and middle slopes than lower slopes, which suggests a preference for higher elevations due to increased solar heating (Lacki and Schwierjohann 2001, p. 486). Northern long-eared bats switch roosts often (Sasse and Perkins 1996, p. 95), typically every 2-3 days (Foster and Kurta 1999, p. 665; Owen et al. 2002, p.2; Carter and Feldhamer 2005, p. 261; Timpone et al. 210, p. 119). Reasons for switching may be temperature, precipitation, predation, parasitism, and ephemeral roost sites (Carter and Feldhamer 2005, p. 264). The northern long-eared bat is comparable to the Indiana bat in terms of summer roost selection, but appear to be more opportunistic (Carter and Feldhamer 2005, pp. 265-266; Timpone et al. 2010, pp. 120-121). Although northern long-eared bats are more opportunistic than Indiana bats, there may be a small amount of roost selection overlap between these two species (Foster and Kurta 1999, p. 670; Timpone et al. 2010, pp. 120-121). Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009, p. 212) to 60 individuals (Caceres and Barclay 2000, p. 3). Adult females give birth to a single pup. Birth likely occurs in late May or early June (Caire et al 1979, p. 406; Easteria 1968, p. 770; Whitaker and Mumford 2009, p. 213), but may occur as late as July (Whitaker and Mumford 2009, p.213). Juvenile volancy (flight) occurs by 21 days after birth (Krochmal and Sparks 2007, p. 651; Kunz 1971, p. 480). Adult longevity is estimated to be up to 18.5 years (Hall 1957, p. 407) with the greatest recorded age of 19 years (Kurta 1995, p.71).

4 FALL SWARMING

(Mid-August to November)

With the onset of fall and cooler temperatures, males return to the caves. They are at the entrances when females and young arrive. Elevated hormone levels trigger males to mate with females. Hibernating females store sperm until spring, exhibiting delayed fertilization (amphigonia retardata). Swarming is a milling of the bats around and out of the cave entrance. This behavior may have several functions, but one seems to bring the sexes together for mating. Members of both sexes feed and gain weight through the fall, thus putting on fat (energy) to help them survive through hibernation. It is not known if juvenile females mate their first autumn. Limited mating may occur in the cave in winter and may even occur in the spring. When temperatures are 50 degrees F or less, the bats start to stay inside the cave.

The majority of this information came from 50 CFR Part 17, Volume 78, No. 191. To all the scientists that contributed to its development, we extend our appreciation and gratitude.

For additional information, please refer to the USFWS Region 3 website (http://www.fws.gov/midwest/endangered/mammals/index.html) and the Northern Long-Eared Bat Interim Conference and Planning Guidance, USFWS Regions 2, 3, 4, 5 & 6, Jan. 6, 2014.

Acknowledgments: The design and artwork for this product were developed by Lochmueller Group, Inc. in Evansville, Ind., in cooperation with the U.S. Fish and Wildlife Service – Bloomington Field Office.

STATUS

On Oct. 2, 2013 in 50 CFR Part 17, Volume 78 and No. 191, the U.S. Fish and Wildlife Service (USFWS) proposed the northern long-eared bat (Myotis septentrionalis) for listing as endangered under the Endangered Species Act (ESA) throughout its range. The USFWS also determined that critical habitat for the northern long-eared bat is not determinable at this time. This proposed rule, if finalized, would extend the Act's protections to the northern long-eared bat. It is anticipated that USFWS will make a decision on the northern long-eared bat listing sometime in mid-October 2014.

SUMMARY OF FACTORS AFFECTING SPECIES

Under Section 4(a)(1) of Act (16 U.S.C. 1533) and its implementing regulations at 50 CFR part 424, USFWS has the authority to list a species based on any of the followin (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. They found that no other threat is as severe and immediate to the northern long-eared bat's persistence as white-nose syndrome (WNS) disease. Therefore, WNS is currently the predominant threat to this species.

FEEDING

The northern long-eared bat has a diverse diet including moths, flies, leafhoppers, caddisflies, spiders and beetles with diet composition differing geographically and seasonally (Brack and Whitaker 2001, p. 208). The most common insects found in the diets of northern long-eared bats are moths and beetles (Feldhamer et al. 2009, p. 45; Brack and Whitaker 2001, p. 207) with spiders also being a common prey item (Feldhamer et al. 2009, p. 45). Foraging techniques include hawking (catching insects in flight) and gleaning (picking insects off stationary features such as leaves or branches) in conjunction with passive acoustic cues (Nagorsen and Brigham 1993, p. 88; Ratcliffe and Dawson 2003, p. 851). Presence in their feces are spiders, other non-flying insects, and green plant material suggest considerable gleaning behavior. The northern long-eared bat has a very high frequency call. Gleaning allows this species to gain a foraging advantage for preying upon moths because moths are less able to detect high frequency echolocation calls (Faure et al. 1993, p. 185). Emerging at dusk, most hunting occurs above the understory, 3 to 10 feet about the ground, but under the canopy (Nagorsen and Brigham 1993, p. 88) on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001, p. 207; LaVal et al. 1977, p. 594). This coincides with data indicating that mature forests are important habitat for foraging in this species (Caceres and Pybus 1998, p. 2).

COMMON NAME

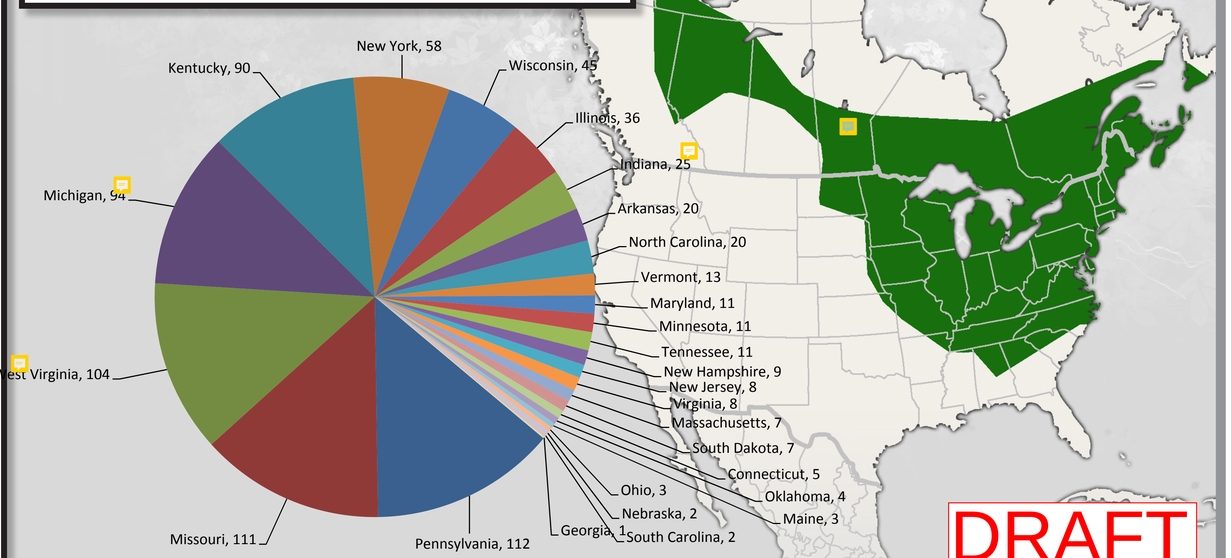
The northern long-eared bat (Myotis septentrionalis) was first described as a distinct species by van Zyll de Jong in 1979 based on geographic separation and difference in morphology. Before that time, the northern long-eared bat was considered a subspecies of Keen's long-eared Myotis (Myotis keenii). No subspecies have been described for Myotis septentrionalis. This species has been recognized by different common names, such as Keen's bat, northern myotis bat, and northern bat. For the purposes of this documentation, we refer to this species as the northern long-eared bat.

SPECIES DESCRIPTION

The northern long-eared is a medium-sized bat as distinguished by its long ears which average 17 mm. When laid forward, they extend beyond the nose but less than 5 mm beyond the muzzle (Caceres and Barclay 2000, p. 1). The tragus is long, pointed and symmetrical. Its length is greater than half the ear. Body color is darker brown on back, and a lighter brown on ventral side. It is most often confused with little brown bat; however, it does not have the sheen to fur, and has longer ears and tragus.

Myotis septentrionalis
Weights and Measurements

Total Length	77mm - 92mm
Forearm Length	34mm - 39mm
Tail	26mm-42mm
Hind Foot	5mm - 11mm
Ear	14mm - 19mm
Tragus	9mm - 11mm
Weight	5g - 9g



DRAFT