

Eastern Small-footed Bat

Myotis leibii

Federal Listing	N/A
State Listing	E
Global Rank	G3/G4
State Rank	S1
Regional Status	Very High



Photo by Brendan Clifford, NHFG

Justification (Reason for Concern in NH)

Like other bats, eastern small-footed bats are relatively long lived and have a low reproductive rate, likely giving birth to a single young per year (Best and Jennings 1997). Tuttle and Heaney (1984) found possible evidence of some twinning. Since eastern small-footed bats are found in rare habitats during summer (rocky outcrops) and winter (caves and mines), they are at risk of population declines if such habitats are lost or degraded. Their slow reproductive rate would, in turn, lead to a slow population recovery time. Eastern small-footed bats have been documented in only 1 of the 7 known hibernacula in New Hampshire (Mascot Lead Mine). Although winter surveys of eastern small-footed bats suggest a stable or even increasing population (Butchkoski 2003, Reynolds unpublished data), total numbers are still extremely low. In fact, eastern small-footed bats are rarer than Indiana bats in most northeastern states that have long-term monitoring data (Trombulak et al. 2001, Thomas, 1993). During summer, small-footed bats have been captured at 3 locations in New Hampshire, including the White Mountain National Forest (Krusic et al. 1996, Chenger 2005), New Boston (Hillsborough County; LaGory et al. 2002), and Surry (Cheshire County; Chenger 2005). Beyond these few data, the species' status in New Hampshire remains almost entirely unknown.

Distribution

Data that describe the range of eastern small-footed bats in New Hampshire are too few to allow a regional comparison of New Hampshire populations or to indicate distribution patterns. Winter distribution data of eastern small-footed bats is limited to one locality in Coos County and one in Rockingham County. Summer records are known from seven localities: the White Mountain National Forest (Krusic et al. 1996; no specific locality available), Bartlett (Coos Carroll County; Chenger 2005), New Boston (Hillsborough County; Lagory et al. 2002), Peirmont (Grafton County; Chenger 2005), Surry (Cheshire County; Chenger 2005), Hinsdale (J.Veilleux pers. com.) and Newington (D. Yates pers. com.).

Habitat

In winter, eastern small-footed bats (*Myotis leibii*) require cave or mine habitat that provides adequate characteristics for successful hibernation. Such characteristics include low levels of human disturbance and a stable microclimate (i.e. temperature stability). Although their hibernation has not been extensively researched, they appear to arrive at hibernacula later than most other species and leave earlier in the spring (Thomas 1993, Best and Jennings 1997). They also prefer colder temperatures than do other *Myotis* bats (Best and Jennings 1997, Butchkoski 2003, Tuttle 2003). For example, they are often found in the coldest sections of a cave or mine, either utilizing short (less than 150 m in length) adits (Best and Jennings 1997) or choosing roost locations near the entrance of

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larger hibernacula (Tuttle 2003). It is also believed that they roost in narrow crevices (Best and Jennings 1997), although all of the individuals documented in New Hampshire were found on exposed surfaces (Reynolds, unpublished data).

Few data describe the summer habitat of eastern small-footed bats in New Hampshire. Most suggest that they roost in rock crevices (Whitaker and Hamilton 1998, Chenger 2003). Chenger (2003) captured 11 small-footed bats in Surry, Cheshire County, and radio tagged 3 individuals (2 adult females and 1 adult male). Data from radio tagged bats revealed several roost sites, each within rock crevices in outcrops near the base of the Surry Mountain Lake dam. Although no radio tagged individuals were reproductive females, it is likely that females give birth and wean young within similar rock crevice roosts. No data describe the rock crevices (crevice dimension, temperature profile, height from ground, etc.) that provided roost habitat for these animals.

NH Wildlife Action Plan Habitats

- Caves and Mines
- Rocky Ridge, Cliff, and Talus
- Appalachian Oak Pine Forest
- Hemlock Hardwood Pine Forest
- Northern Hardwood-Conifer Forest

Distribution of
EASTERN SMALL-FOOTED BAT
in New Hampshire

■ Core Range
▨ Localized



Distribution Map

Current Species and Habitat Condition in New Hampshire

Hibernating eastern small-footed bats are known only from the Mascot Lead Mine (Coos County) and one site in Rockingham County. The New Hampshire Natural Heritage Survey ranked Mascot Lead

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Mine as 'B/C', indicating 'fair to good quality and prospects for long-term conservation'. However, there are concerns about long-term safety of the mine interior which may alter habitat availability due to debris and mine collapse. In 2004, 9 hibernating individuals were documented in this mine. In 2014 there were 3 hibernating individuals. Only one individual was found in the Rockingham County site. Given the small number of surveys, there is not enough data to conduct an analysis of trends and viability of winter populations. Summer surveys at Surry Mountain Lake show a decline in capture rates since the onset of White-Nose Syndrome (Moosman et al 2013).

Population Management Status

There is no management aimed at the conservation of eastern small-footed bats, although the one known winter population is incidentally protected by the bat gate at Mascot Lead Mine, and the Surry Mountain site is partially protected by the ACOE through its management plan. Lack of data on the distribution of eastern small-footed bats prohibits identification of conservation opportunities beyond the need to conduct additional habitat surveys.

Regulatory Protection (for explanations, see Appendix I)

- NHFG Permit for collection or possession

Quality of Habitat

The known winter population of eastern small-footed bats is in the abandoned Mascot Lead Mine. This is a relatively stable mine with multiple levels and two openings, both of which are gated to prevent human disturbance. There are concerns with stability within portions of the mine, with debris accumulating and a loss of structural integrity which will likely cause collapses within the mine. No microclimate data have been collected within Mascot Lead Mine.

Although several of the potential hibernacula are shallow, there are no winter microclimate data to determine whether they are cold and stable enough to maintain a hibernating population of eastern small-footed bats. Because most of the summer records of eastern small-footed bats occur in southern New Hampshire, it will be important to assess any potential hibernacula in Hillsborough, Merrimack, Cheshire, and Rockingham counties as they are discovered.

Habitat Protection Status

The Department of Resources and Economic Development (DRED) manages Mascot Lead Mine. The Nature Conservancy (TNC) maintains the gates that restrict access to the mine. The New Hampshire Natural Heritage Survey has given all known bat hibernacula a conservation rank that indicates habitat quality and prospects for long-term conservation. Mascot Lead Mine was ranked as 'B/C', indicating a 'fair to good quality and prospects for long-term conservation'. DRED also owns and manages the Rockingham County location, and has sealed the entrance from human visitation.

Some of the known summer roosts are on state or federal land which provides some level of protection, however management decisions at those sites may affect habitat quality.

Habitat Management Status

The only ongoing habitat management action occurring in Coos County is the bat gate at Mascot Lead Mine. These gates, used over the last 35 years, are steel structures installed in mine or cave entrances to restrict human access without hindering air flow or bat flight. Because many caves and mines are

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found in remote locations, bat gates are “the only means available for protecting these [colonies]” (Pierson et al. 1991: 31). It is reasonable to assume these bat gates have been highly effective at minimizing human disturbance due to spelunking activities, though surveys in 1993 and 2004 did not indicate significant changes from 1992 populations. The Rockingham County site has the entrance for humans also blocked in a way that does not change the traditional bat entry.

Threats to this Species or Habitat in NH

Threat rankings were calculated by groups of taxonomic or habitat experts using a multistep process (details in Chapter 4). Each threat was ranked for these factors: Spatial Extent, Severity, Immediacy, Certainty, and Reversibility (ability to address the threat). These combined scores produced one overall threat score. Only threats that received a “medium” or “high” score have accompanying text in this profile. Threats that have a low spatial extent, are unlikely to occur in the next ten years, or there is uncertainty in the data will be ranked lower due to these factors.

Disturbance from humans exploring bat hibernacula (Threat Rank: High)

Active cavers and casual cave explorers disturb bats when they enter occupied caves and mines. Noise, light, changes in temperature and airflow, and physical contact can all disturb bats (Thomas 1995). In winter during hibernation, these disturbances can cause bats to arouse from hibernation and thus use up precious stored energy. Bats susceptible to White-Nose Syndrome are especially vulnerable to disturbance, as the disease already causes increased numbers of arousals and depletion of stored fat.

Eastern small-footed bats are less affected by this threat as they occur at hibernacula that are gated to prevent cavers from entering. It is unknown where most eastern small-footed bats hibernate in NH.

Mortality and species impacts (loss of fitness) due to White-Nose Syndrome (Threat Rank: High)

Eastern small-footed bats have been affected by White-Nose Syndrome (WNS), a fungal disease that affects bats during hibernation. The fungus, *Pseudogymnoascus destructans*, grows into the wings, muzzles and ears of the bats (Lorch et al. 2011), disrupting metabolic functions (Meteyer et al. 2009, Cryan et al. 2013, Verant et al. 2014) and causing bats to arouse from hibernation more frequently and stay awake longer than uninfected bats (Lorch et al. 2011, Reeder et al. 2012). This causes them to use up stored energy (fat) at a much higher rate (Reeder et al. 2012). Bats cannot replenish their fat stores in winter as their food source is unavailable. They perish from starvation, some first flying out the hibernacula in mid-winter in a desperate search for food. Since bats are in hibernation they do not mount an immune response to this disease.

WNS was first found in NH in 2009. Winter surveys have not found a significant decline as the number of eastern small-footed bats found hibernating in NH has always been very small. However, drops in population have occurred in other affected states (Turner et al. 2011).

List of Lower Ranking Threats:

Habitat degradation and mortality due to pesticide application at roost sites

Species impacts from agricultural pesticide use causing prey declines

Habitat degradation from succession that causes loss of drinking and foraging habitats

Mortality and conversion of migratory habitat due to wind turbine development

Habitat degradation and conversion due to changes in mine configuration from landowner & natural causes, including reopening or closing mines

Habitat conversion and degradation due to removal of summer roosting and foraging areas

Actions to benefit this Species or Habitat in NH

Promote organic practices and integrated pest management (IPM)

Primary Threat Addressed: Species impacts from agricultural pesticide use causing prey declines

Specific Threat (IUCN Threat Levels): Pollution / Agricultural & forestry effluents / Herbicides & pesticides

Objective:

Provide technical assistance to organizations that provide education, technical assistance and funding to farmers and homeowners on organic growing practices and IPM.

General Strategy:

Work with the Northeast Organic Farmers Association, UNH Cooperative Extension, NRCS, nursery stock growers, garden centers, garden clubs, landscapers and others to educate farmers, homeowners and commercial landscapers on using IPM and organic practices

Political Location:

Statewide

Watershed Location:

Statewide

Monitor bat populations

Objective:

Continue to monitor hibernating and summer bat populations.

General Strategy:

Monitor hibernacula at least every three years for the presence and abundance of bats. Resurvey summer mist netting sites that have been historically monitored such as Surry Mountains Dam and New Boston Air Force Station. Survey potential eastern small-footed bat summer roost sites including both daytime transect surveys (Moosman 2014) and mist netting.

Political Location:

Statewide

Watershed Location:

Statewide

Prevent disturbances to hibernating bats

Primary Threat Addressed: Disturbance from humans exploring bat hibernacula

Specific Threat (IUCN Threat Levels): Human intrusions & disturbance

Objective:

Prevent recreational use of known bat hibernacula during the hibernation period

General Strategy:

Through education, bat-friendly gates and other means prevent people from entering hibernacula during the hibernation period.

Political Location:

Watershed Location:

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Coos County, Grafton County, Merrimack County, Rockingham County

Androscoggin-Saco Watershed, Upper CT Watershed, Middle CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Protect hibernacula from structural damage

Primary Threat Addressed: Habitat degradation and conversion due to changes in mine configuration from landowner & natural causes, including reopening or closing mines

Specific Threat (IUCN Threat Levels): Energy production & mining

Objective:

Protect hibernacula from structural damage such as changes to mine opening or configuration.

General Strategy:

Work with owners of hibernacula to encourage them to voluntarily refrain from changing the opening or the configuration of the interior of mines, unless it is to erect a bat-friendly gate over the opening. Encourage the installations of bat-friendly gates.

Political Location:

Coos County, Grafton County, Merrimack County

Watershed Location:

Androscoggin-Saco Watershed, Upper CT Watershed, Middle CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Participate in efforts regarding White-Nose Syndrome

Primary Threat Addressed: Mortality and species impacts (loss of fitness) due to White-Nose Syndrome

Specific Threat (IUCN Threat Levels): Invasive & other problematic species, genes & diseases / Invasive non-native/alien species/diseases / Named species

Objective:

Assist in the research, management and planning efforts to control the spread of, find a treatment for, and recover bat species affected by White-Nose Syndrome.

General Strategy:

Participate in regional, national and international research, management and planning efforts to control the spread of, find a treatment for, and recover bat species affected by White-Nose Syndrome. Continue to participate in national research projects such as acoustic transects and emergence counts. Continue to participate in research efforts as requested. Participate in regional and national workshops, plans and projects for conservation, recovery and communications about White-Nose Syndrome.

Political Location:

National, Northeast, Statewide

Watershed Location:

Statewide

Develop standard processes to reduce the effect of wind energy production on bats

Primary Threat Addressed: Mortality and conversion of migratory habitat due to wind turbine development

Specific Threat (IUCN Threat Levels): Energy production & mining

Objective:

Develop and implement rules on siting and operation of wind turbines to reduce mortality of bats during construction and operation

General Strategy:

Develop and implement siting rules that protect migration routes and occupied habitat from wind turbine development. Develop required operational mitigation measures such as curtailment to reduce bat mortality post-construction. Develop these in conjunction with nearby states to provide consistency to energy developers across the northeast.

Political Location:

Northeast, Statewide

Watershed Location:

Statewide

References, Data Sources and Authors

Data Sources

Data on winter distribution were compiled by examining New Hampshire Natural Heritage Inventory – Bat Hibernaculum Record data sheets, and by examining the collection dates of specimens deposited in museum collections and college/university teaching collections. Summer distribution data were determined by examining specimen collections, published literature, and unpublished sources.

To determine the winter distribution at known hibernacula, New Hampshire Natural Heritage Survey-Hibernacula Survey Data Sheets were examined. To determine habitat patch protection status of Mascot Lead mine, the site was mapped on the Conservation Lands GIS data layer (GRANIT – 2003 data).

Data Quality

Data on the distribution of eastern small-footed bats in New Hampshire are extremely limited (see discussions in elements 1.2 and 1.4). The quality of data is believed to be good, as qualified bat biologists made identifications. Occurrence records and research efforts aimed at determining distribution patterns in New Hampshire are few.

There have been several winter surveys at Mascot Lead Mine since 1987; most of these surveys were conducted since installation of the bat gate in 1992. Although these surveys were extensive, no microclimate data were collected. Future surveys should be conducted in late winter (December through February) to ensure eastern small-footed bats have begun hibernation (Thomas 1993). Furthermore, surveys should not be done during mild weather periods when eastern small-footed bats are known to temporarily leave hibernacula (Butchkoski 2003).

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