Big Brown Bat

Eptesicus fuscus

Federal Listing	N/A
State Listing	SGCN
Global Rank	G5
State Rank	S3
Regional Status	High

Photo by NHFG

Justification (Reason for Concern in NH)

Big brown bats, like all hibernating bats in NH, are affected by White-Nose Syndrome. Data from the northeast region shows a decline of 41% overall in cave and mine hibernacula (Turner et al 2011). Because of their larger body size and ability to hibernate in buildings, big brown bats have not been as affected as other species, but summer population data are lacking so that the actual effect of White-Nose Syndrome is unknown. Big brown bats often use buildings for maternity colonies, which results in conflicts with humans. In NH, Wildlife Control Operators may only conduct exclusions to remove bat colonies, and may not exterminate them. This is less damaging to bats except when the exclusion is done during the time females are caring for young, generally late May through early August. Timing of exclusions to prevent this is only regulated in uninhabited buildings.

Distribution

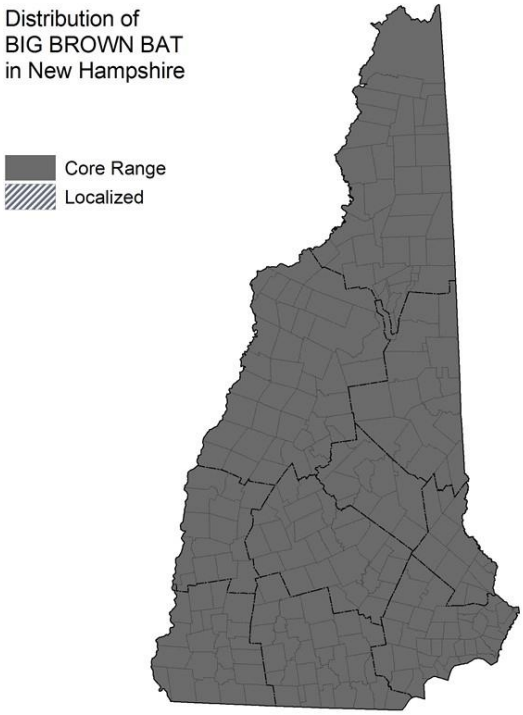
Big brown bats can be found statewide in all forest types. They are unlikely to be found in high elevation forests. They are unlikely to roost in young forests, but will use them for foraging. They also forage over wetlands, streams and open areas including in suburban and urban landscapes.

Habitat

Big brown bats use three types of habitat, forests, buildings and caves or mines. Forests with associated openings, streams and wetlands are used for foraging from the time they emerge from hibernation in the spring to the time they enter hibernation in late fall. Bats will use trees for day and night roosts during this active season. They will use many kinds of buildings for night and maternity roosts and heated or unheated but insulated buildings for hibernating. They also use caves or mines or similar artificial subterranean structures such as bunkers for hibernating.

NH Wildlife Action Plan Habitats

- Caves and Mines
- Hemlock Hardwood Pine Forest
- Appalachian Oak Pine Forest
- Floodplain Habitats
- Lowland Spruce-Fir Forest
- Northern Hardwood-Conifer Forest
- Northern Swamps
- Temperate Swamps



Distribution Map

Current Species and Habitat Condition in New Hampshire

Big brown bats have been affected by white-nose syndrome but it is unknown how negatively. They still are found in buildings, but wildlife control operators say they are doing many fewer evictions overall. As it is unknown how many of the colonies they used to evict were little brown bats versus big brown bats, this data does not provide an indication of big brown bat population health.

Population Management Status

Big brown bat populations are not managed except that evictions from buildings during pupping season are forbidden in buildings not occupied by humans.

Regulatory Protection (for explanations, see Appendix I)

- NHFG FIS 308 Wildlife Control Operators

Quality of Habitat

There are adequate forest and hibernation locations, including those out of state, for big brown bats. Hibernacula are not as high quality due to the presence of *Pseudogymnoascus destructans*, the fungus that causes white-nose syndrome. This fungus persists in hibernacula in the absence of bats (Lorch et al 2012).

Habitat Protection Status

Most bat hibernacula in NH are not protected. Three are on state land but only two are gated. One hibernacula on private land has a conservation easement with a special management unit defined around the mine entrance but is not gated. The other hibernacula are located on private land.

Habitat Management Status

There is no habitat management for this species other than educating landowners on managing individual colonies.

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.

Habitat conversion due to negative perceptions of bats by homeowners that results in loss of roosting habitat in buildings (Threat Rank: High)

Big brown bats often use human structures for roosting, usually in the attic or walls. Humans often do not like having bats roosting in their buildings, particularly in houses and businesses and so remove them, mostly through exclusion. Exclusions done when pups are in residence can lead to the death of the pups. Bats entering the parts of buildings that humans use may be killed due to fears about the bats. Big brown bats will also hibernate in buildings.

Habitat conversion from changes in mine configuration due to landowner and natural causes including reopening or closing mines (Threat Rank: Medium)

Changes in the mine entrances can block access or change the temperature and humidity within the mine. Bats have specific ranges of temperatures and humidity they require for hibernating. Reopening of mines for active use can disturb or kill hibernating bats, or make the mine unsuitable for hibernating.

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

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.

Big brown bats occur at hibernacula that may experience high levels of human disturbance. They also hibernate in the attics and walls of houses, which may mean they are less sensitive to noise.

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

Big brown 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 big brown bats found hibernating in NH has always been variable. The population in other affected states has dropped overall by 41% population (Turner et al. 2011). Big brown bats may be less susceptible due their larger body size and habit of hibernating in buildings, which are not cold or humid enough for the fungus causing WNS to grow.

List of Lower Ranking Threats:

Species impacts from agricultural pesticide use causing prey declines

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

Habitat degradation from timber harvest that removes summer roosting and foraging areas

Habitat degradation from roads and powerline development that removes roosting habitat

Mortality and conversion of migratory habitat due to wind turbine development

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

Actions to benefit this Species or Habitat in NH

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.

Political Location:
Statewide

Watershed Location:
Statewide

Protect occupied roosting trees

Primary Threat Addressed: Habitat degradation from timber harvest that removes summer roosting and foraging areas

Specific Threat (IUCN Threat Levels): Biological resource use

Objective:
Prevent occupied roosting trees from being cut down.

General Strategy:
Develop voluntary BMPs for forestry that help landowners and foresters identify and protect known and potential roosting trees during harvesting operations. Provide these guidelines to organization building trails or otherwise potentially cutting trees. BMPs could include time of year restrictions for cutting, tree size limitation and other techniques. Coordinate with other states for consistency.

Political Location:

Watershed Location:
Statewide

Protect summer colonies in buildings

Primary Threat Addressed: Habitat conversion due to negative perceptions of bats by homeowners that results in loss of roosting habitat in buildings

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

Objective:
Protect summer colonies in buildings without compromising public health

General Strategy:
Protect summer colonies by prohibiting exclusion of bats from buildings during the time they have non-volant young (May 15-August 15). Exceptions should be available in the case of a documented rabid bat in the building or other public health issue. Develop materials for wildlife control operators and homeowners about bats in houses and their reproductive cycle to build support for the rule change and compliance afterwards.

Political Location:
Statewide

Watershed Location:
Statewide

Protect hibernacula from structural damage

Primary Threat Addressed: Habitat conversion from changes in mine configuration due to landowner and 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, Rockingham County

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

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

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 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

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

References, Data Sources and Authors

Data Sources
Information on big brown bats comes from NHFG unpublished data, hibernation survey reports from Dr. Jacques Veilleux and Dr. Scott Reynolds, and published scientific literature.

Data Quality
Cave and mine hibernacula data is fairly comprehensive. Data is missing from what may have been the largest hibernacula, still not specifically located but known to be on the slopes of Mount Washington due to the presence of hundreds of sick bats flying in February of 2010. Hibernation data from houses is lacking as is summer population data. Data on most threats is well documented in the scientific literature.

2015 Authors:
Emily Preston, NHFG

2005 Authors:

Literature

Arnett, E. B., technical editor. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of bat fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, TX.

Baerwald, E. F., D'Amours, G. H., Klug, B. J., & Barclay, R. M. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. Current biology, 18(16), R695-R696.

Barclay, R.M.R., and R.M. Brigham. 2001. Year-to-year reuse of tree-roosts by California bats (*Myotis californicus*) in southern British Columbia. American Midland Naturalist 146:80-85.

Bennett, B. S., & Thies, M. L. 2007. Organochlorine pesticide residues in guano of Brazilian free-tailed bats, *Tadarida brasiliensis* Saint-Hilaire, from East Texas. Bulletin of environmental contamination and toxicology, 78(3-4), 191-194.

Clark, D. R. 1988. How sensitive are bats to insecticides? Wildlife Society Bulletin, 399-403.

Cryan, P. M., Meteyer, C. U., Blehert, D. S., Lorch, J. M., Reeder, D. M., Turner, G. G., Webb, J., Behr, M., Verant, M., Russell, R.E. & Castle, K. T. 2013. Electrolyte depletion in white-nose syndrome bats. Journal of Wildlife Diseases, 49(2), 398-402.

Henderson, L.E. and H.G. Broders. 2008. Movements and resource selection of the northern long-eared myotis (*Myotis septentrionalis*) in a forest-agriculture landscape. Journal of Mammalogy. 89(4): 952-963.

Hensen, F. 2004. Thought and working hypotheses on the bat compatibility of wind energy plants [in German]. Nyctalus 9(5):427-436.

Horn J.W., E.B. Arnett, and T.H. Kunz. 2008. Behavioral responses of bats to operating wind turbines. Journal of Wildlife Management 72(1): 123-132.

Kunz, T.H., E.B. Arnett, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin. M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs and hypotheses. Frontiers in Ecology and the Environment. 5(6): 315-324.

Kunz, T.H., E.L.P. Anthony, and W.T. Rumage. 1977. Mortality of little brown bats following multiple pesticide applications. Journal of Wildlife Management 41:476-483.

Lorch, J. M., Muller, L. K., Russell, R. E., O'Connor, M., Lindner, D. L., & Blehert, D. S. (2013). Distribution and environmental persistence of the causative agent of white-nose syndrome, *Geomyces destructans*, in bat hibernacula of the eastern United States. Applied and environmental microbiology, 79(4), 1293-1301.

Meteyer, C. U., Buckles, E. L., Blehert, D. S., Hicks, A. C., Green, D. E., Shearn-Bochsler, V., Thomas, N.J., Gargas, A, & Behr, M. J. 2009. Histopathologic criteria to confirm white-nose syndrome in bats. Journal of Veterinary

National Academy of Sciences. 2007. Environmental impacts of wind energy projects. Washington, D.C. National Academies Press.

Reeder DM, Frank CL, Turner GG, Meteyer CU, Kurta A, Britzke ER, et al. 2012. Frequent Arousal from Hibernation Linked to Severity of Infection and Mortality in Bats with White-Nose Syndrome. PLoS ONE 7(6): e38920.

Thomas, D.W. 1995. Hibernating bats are sensitive to nontactile human disturbance. Journal of Mammalogy 76:940-946.

Turner,G. G., D. M. Reeder, and J. T. H. Coleman. 2011. A Five-year Assessment of Mortality and Geographic Spread of White-Nose Syndrome in North American Bats, with a Look at the Future. Update of White-Nose Syndrome in bats. Bat Research News, 52:13-27.

Veilleux, J.P. and S.L. Veilleux. 2004. Colonies and reproductive patterns of tree-roosting female eastern pipistrelle bats in Indiana. Proceedings of the Indiana Academy of Science 113:60-65.

Verant, M. L., Carol, M. U., Speakman, J. R., Cryan, P. M., Lorch, J. M., & Blehert, D. S. 2014. White-nose syndrome initiates a cascade of physiologic disturbances in the hibernating bat host. BMC physiology, 14(1), 10.