BEST MANAGEMENT PRACTICES FOR BATS IN NEW MEXICO

Background and Identification of Interaction with Wind Energy

There is limited data available on the nature of bat fatalities at wind energy sites across the United States. Considering the number of these facilities, there has been only a small number of published reports to date. Because of the variation in the methods and metrics used in these investigations, it is difficult to compare the results among them. However, there have been general trends that have been consistently reported by these studies. Perhaps the most striking is the relatively high mortality among migratory tree-roosting species— comprising approximately 75% of reported bat fatalities compared to species that roost in karst structures or rock crevices. Of the documented fatalities, about 41% have been hoary bats (*Lasiurus cinereus*), 24% red bats (*Lasiurus blossivilli* and *L. borealis*), 11% eastern pipistrelles (*Pipistrellus subflavus*), 8% silver-haired bats (*Lasionycteris noctivagans*), 6% little brown bats (*Myotis lucifugus*), 6% Brazilian free-tailed bat (*Tadarida brasiliensis*), 2% big brown bat (*Eptesicus fuscus*), and about 2% unknown or incidental species.[1] Bat fatalities are expected to increase relative to the development of wind projects based on predictive models.[2]

There are many potential proximate and ultimate causes of bat fatalities at wind turbines, including: random collision with rotating blades, barotrauma (injury due to abrupt changes in barometric pressure), attraction to blade motion, attraction to modified landscape features, attraction to turbines as roost or mating sites, and attraction to insect aggregation at turbine sites.[3]

There are about 30 species of bats known to roost, hibernate, or otherwise reside in New Mexico (Table 1). Seventeen are known to roost in karst structures, four are known to roost in trees. Of these species, two are legally protected by state or federal statutes: the lesser long-nosed bat (*Leptonycteris curasoae*) and Mexican long-nosed bat (*Leptonycteris nivalis*). Both of these species are confined to the extreme southwest corner of the state. Most all of the other species are listed as Sensitive or as Species of Concern and management agencies track their population integrity and distribution and consider the potential impacts to them when reviewing proposed actions.

State of the Science

Within the last few years, bats have become a highly discussed and debated class of animals that are affected by wind energy developments. There is great need for an effective method to assess and minimize potential impacts to bats. Unfortunately, the causative factors behind the few mortality patterns that have been observed to date are not well understood. Added to this paucity of much-needed information, basic biological components such as population size and distribution, habitat requirements, and reproduction for the majority of North America's bat species is for the most part unknown. Yet, there is great pressure from regulatory and enforcement agencies, stakeholders, and the public to address this issue.

To date, there have not been any published post-construction bat mortality studies in New Mexico. Of the studies published from other parts of the country, bat fatalities per turbine per year have ranged from 0 to 46.[3,4,5] There have not been any reliable correlations made between preconstruction bat activity and post-construction bat fatalities.

There is not a consensus among stakeholders for methods to minimize bat mortality at wind energy developments. This is primarily due to a paucity of data regarding the natural history and distribution of bats and their interaction with wind projects.

Best Management Practices

1. Conduct acoustic surveys at various heights to determine use of the site by local and migratory bat species. Acoustic bat detectors can be mounted on existing structures, such as meteorological towers, within the proposed development site.
    - Features that may attract high bat concentrations include but are not limited to: bat hibernacula (hibernating areas), forested woodlands, riparian zones, playa lakes and other

waterbodies, exposed cliffs, caves, karst formations, abandoned mines, and abandoned buildings and connectivity between habitats.

2. Determine survey methods, in consultation with the USFWS and NMDGF, and conduct surveys for presence and possible use of the site by local and migratory bat species.
3. Participate in on-going and new research on avoidance and minimization techniques. Examples of potential minimization techniques include construction considerations, operational mitigation techniques,[7] potential use of proven deterrent technology and adaptive management plans.[7,8]

Acknowledgments

This document was prepared by Mike Balistreri of Avian Consulting Services. The final document is a result of the collaborative process of the NM WWC.

Additional Information and Resources Consulted

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Table. 1 Bat Species of New Mexico

Information presented in this table was compiled from *Bats of the United States* (Harvey, et al., 1999), *The Bats of Texas* (Schmidley, 1991), the BISON-M database (http://www.bison-m.org/index.aspx), and observations by M. Balistreri. Agency status was taken from state (http://www.bison-m.org/index.aspx) and federal (http://www.fws.gov/southwest/es/newmexico) databases and is current as of November 2010.

Common Name *Scientific Name*	Status		Roost Sites	NM Distribution
	FWS	NM		
Pallid bat *Antrozous pallidus pallidus*	—	—	caves, mines, rock outcrops tree cavities, buildings	throughout state
Mexican long-tongued bat *Choeronycteris mexicana*	SOC	S	caves, mines, buildings, culverts	Hidalgo County
Townsend's big-eared bat *Corynorhinus towsendii pallescens*	SOC	S	caves, mines, buildings	throughout state
Big brown bat *Eptesicus fuscus pallidus*	—	—	buildings, bridges, trees, structures, caves, mines	throughout state
Spotted bat *Euderma maculatum*	—	T	cliff faces, rock crevices, cracks	throughout state, except east/northeast ¼
Western mastiff bat *Eumops perotis californicus*	—	S	crevices in cliffs and rocky canyons	Hidalgo County
Allen's big-eared bat *Idionycteris phyllotis*	SOC	S	rock shelters, caves, mines	Catron, Grant. Sierra, Socorro counties
Silver-haired bat *Lasionycteris noctivagans*	—	—	under bark, woodpecker holes, open buildings	throughout state
Western red bat *Lasiurus blossevillii*	SOC	S	among foliage of streamside trees	southwest ¼
Eastern red bat *Lasiurus borealis*	—	S	among foliage of trees	extreme southern, southeast, and east
Hoary bat *Lasiurus cinereus cinereus*	—	—	among foliage of trees	throughout state
Western yellow bat *Lasiurus xanthinus*	—	T	leafy vegetation – commonly hackberry and sycamore	Hidalgo County
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	E	T	caves, mines	Hidalgo County
Mexican long-nosed bat *Leptonycteris nivalis*	E	E	caves, mines, culverts, tree cavities, buildings	Hidalgo County
California leaf-nosed bat *Macrotus californicus*	—	—	caves, mines	possibly in Hidalgo County

Table 1 – *continued*

Common Name *Scientific Name*	Status		Roost Sites	NM Distribution
	FWS	NM		
Ghost-faced bat *Mormoops megalophylla*	—	—	caves, tunnels, mines, buildings	possibly in Hidalgo County
Southwestern myotis *Myotis auriculus apache*	—	—	unknown – night roosts in caves, mines, buildings	western ½ south of McKinley County
California myotis *Myotis californicus californicus*	—	—	rock crevices, tree cavities, under bark, buildings	western ½ and a bit farther east in extreme south
Western small-footed myotis *Myotis ciliolabrum melanorhinus*	—	S	rock crevices, clay banks, bark, buildings, talus slopes	throughout state
Long-eared myotis *Myotis evotis evotis*	—	S	caves, mines, rock crevices, under bark, buildings	throughout state, except extreme east and south
Little brown bat *Myotis lucifugus carissima*	—	S	caves, mines, buildings, trees	primarily northern ⅓
Occult little brown bat *Myotis lucifugus occultis*	—	S	caves, mines, buildings, trees	western ½
Fringed myotis *Myotis thysanodes thysanodes*	—	S	caves, mines, buildings	throughout, except extreme east and south
Cave myotis *Myotis velifer incautus*	—	S	caves, mines, buildings	southeast ¼, Hidalgo and Grant counties
Long-legged myotis *Myotis volans interior*	—	S	trees, rock crevices, streamside banks, buildings	throughout state
Yuma myotis *Myotis yumanensis yumanensis*	—	S	caves, mines, buildings, bridges	throughout state
Pocketed free-tailed bat *Nyctinomops femorosacca*	—	—	crevices in cliffs and tall rocky outcrops	Grant, Hidalgo, Lea, Eddy counties
Big free-tailed bat *Nyctinimops macrotis*	—	S	crevices in cliffs, buildings	throughout state
Canyon bat (western pipistrelle) *Parastrellus hesperus hesperus*	—	—	rock crevices and piles, burrows, mines, buildings	throughout state
Brazilian free-tailed bat *Tadarida brasiliensis mexicana*	—	—	caves, mines	throughout state