

BATS

Background and Description of Interaction with Wind Development¹

Mortality of bat species at wind energy developments is a recognized phenomenon. There are 19 confirmed bat species that occur within Colorado; one additional species is suspected to occur in Colorado due to suitable habitat within the state that is in close proximity to populations in other states (Table 1).^{2,3} Of those species occurring in Colorado, big brown bats, eastern red bats, hoary bats, silver-haired bats, little brown bats, tri-colored bats, and Brazilian free-tailed bats have been identified among fatalities at U.S. wind developments.⁴

Most publicly available bat fatality studies have been conducted on eastern populations. The bats most commonly observed as fatalities are migratory tree-roosting species, of which hoary bats, eastern red bats, and silver-haired bats are found in the highest numbers.⁴ Levels of bat mortality are highly variable depending upon turbine type, geographic location, and observed wind speeds. However, it appears that highest mortality occurs on nights with low wind speed and low barometric pressure.⁴ Early studies confirmed that bat mortality is not related to the presence of FAA-mandated lighting on turbines. Fatalities are highest from mid-summer through early fall during known migration periods. Two causes of mortality have been identified: mortality due to barotrauma and mortality due to direct collision with moving turbine blades.

State of the Science

Where studies have been conducted on post-construction mortality of bat species at North America wind energy developments, study protocols, robustness of studies, and species of interest vary widely. Recently, meta-analysis articles have been published in well-known, peer-reviewed scientific journals that explore the patterns of bat fatalities at North American wind developments.^{4,5,6}

Why bats are susceptible to injury or death from wind turbines is not well understood at this time. Many hypotheses have been postulated,⁷ two of which have been tested.^{8,9}

Results from one publicly available post-construction monitoring study in northeastern Colorado confirm patterns observed elsewhere in North America. At Spring Canyon Wind Project in Logan County, hoary bats were observed as fatalities, with bat mortality the highest during the month of August. Of the 20 1.5-megawatt (MW) turbines searched for fatalities, dead bats were located at seven turbines. When corrected for searcher efficiency and carcass persistence, annual bat mortality at Spring Canyon was calculated to be 1.9 bats/MW/year.¹⁰ The mortality observed at Spring Canyon is similar in magnitude to mortality observed at other wind energy developments in similar habitat in the Rocky Mountains, specifically Foote Creek Rim in Wyoming (2.0 bats/MW/year).⁴

Because of the paucity of bat studies in Colorado, no information is available to assess the statewide impact of wind energy developments on bat species. In comparison to other regions in the U.S., the potential threat to bat species in Colorado is expected to be low according to current scientific understanding.⁴

Best Management Practices

1. Conduct acoustic surveys at various heights to determine use of the site by local and migratory bat species.¹¹ 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.

Avoid

The best avoidance strategy for preventing bat mortalities at wind energy developments is to avoid development in areas of high bat use as determined by evaluation of bat habitat and preconstruction acoustic monitoring.¹²

Minimize

There is not a consensus among stakeholders for methods to minimize bat mortality at wind energy developments. Experts in bat ecology and wind development agree the best minimization strategy for reducing bat mortalities at wind energy developments is to avoid development in areas of high bat use. If placement of wind farm infrastructure near areas of known or potential high use by bat species is unavoidable, then consultation with Colorado Division of Wildlife is recommended. In addition, continued participation in on-going and new research on minimization techniques is encouraged. For example, research suggests that the use of acoustic deterrents with an acoustic envelope large enough to encompass the entire rotor swept area has the potential to discourage bats from interacting with wind turbines.¹³ Additional examples of potential minimization techniques include construction considerations, operational mitigation techniques, and adaptive management plans.^{14,15}

Conservation Offsets (Mitigation)

Because of the variability among potential developments, habitat within potential developments, and bat species that have potential or are documented to occur within the potential development, wind developers should work with knowledgeable environmental biologists to determine which conservation offsets and potential mitigations, if any, are most appropriate for their particular development site.

Acknowledgments

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Additional Information and Resources Consulted

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Table 1: Bat species found in Colorado.

Common name	Scientific name
big brown bat**	<i>Eptesicus fuscus</i>
big free-tailed bat	<i>Nyctinomops macrotis</i>
Brazilian free-tailed bat**	<i>Tadarida brasiliensis</i>
California myotis	<i>Myotis californicus</i>
canyon bat	<i>Parastrellus</i> [formerly <i>Pipistrellus</i>] <i>hesperus</i>
eastern red bat**+	<i>Lasiurus borealis</i>
fringed myotis	<i>Myotis thysanodes</i>
hoary bat**+	<i>Lasiurus cinereus</i>
little brown bat**	<i>Myotis lucifugus</i>
long-eared myotis	<i>Myotis evotis</i>
long-legged myotis	<i>Myotis volans</i>
pallid bat	<i>Antrozous pallidus</i>
silver-haired bat**+	<i>Lasionycteris noctivagans</i>
spotted bat	<i>Euderma maculatum</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
tri-colored bat**	<i>Perimyotis</i> [formerly <i>Pipistrellus</i>] <i>subflavus</i>
western small-footed myotis	<i>Myotis ciliolabum</i>
Yuma myotis	<i>Myotis yumanensis</i>
Allen's big-eared bat	<i>Idionycteris phyllotis</i>
cave myotis***	<i>Myotis velifer</i>

** Bat species that have been documented at wind energy developments elsewhere in their range.

+ Bat species with the highest recorded numbers of mortalities at wind energy developments.

*** Bat species suspected to occur in Colorado due to presence of suitable habitat and proximity to populations in other states.