



METEOROLOGICAL DATA AND BAT ACTIVITY: DEVELOPING CONSERVATION MEASURES FOR WIND ENERGY



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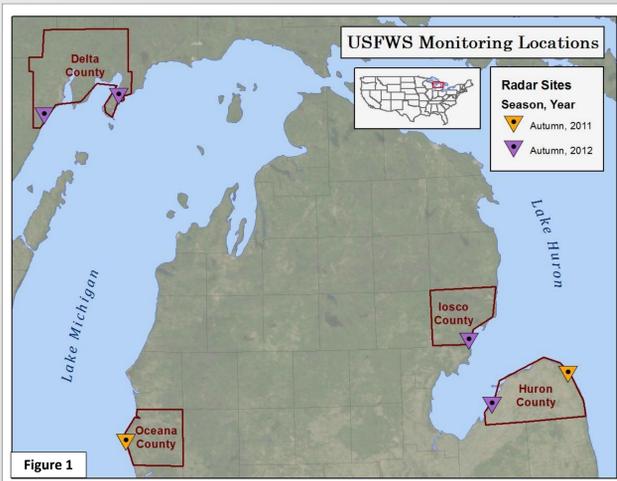
Management Question: At what wind (cut-in) speed is take of an Indiana bat not reasonably expected, thus compatible with the Service's determination that a facility need not obtain an Incidental Take Permit?

Research questions:

1. When did bat activity occur during the fall season?
2. What were wind speeds when bat activity was low?
3. What were temperatures when bat activity was low?



An ultrasonic/acoustic monitor



We established study sites in Oceana and Huron counties in 2011. In 2012, we sampled new locations in Huron, Iosco, and Delta counties, Michigan (Figure 1). At each location we used two automated acoustic monitors (SM2BAT+, Wildlife Acoustics Inc.²) that recorded nightly from 30 minutes after sunset to 2.5 hours after sunrise. Each pair of monitors was associated with a weather station (Davis Vantage Pro 2 WeatherLink²) and both weather and bat pass data were summarized in 10-minute time blocks. We defined a bat pass as a series of two or more consecutively recorded vocalizations separated by less than one second. Vocalizations were captured at a height of about 1 m and meteorological data were recorded at a height of about 7 m. Subsequent analysis may reveal conditions associated specifically with Indiana bat activity.

Results:

Mean wind speed or temperature thresholds can indicate operational safe zones.

Data aggregated across sites show that 99.9% of used time blocks occurred when wind speeds were below 7.6 m/s or the temperature was above -1° C (Table 1). These types of data may provide a means to conserve bats while supporting wind energy. However, standard data collection methods are needed. Questions related to height at which meteorological and vocal activity are measured and how these measurements tie to turbine operations require consideration. Additional information on the relationship between bat fatalities and vocal activity is also needed. Region 3 of the USFWS is actively soliciting collaboration with wind energy companies and research institutions to inform this mutually beneficial conservation effort.

Table 1		
Percent of Used Time Blocks	6 Sites in Michigan	
	Occurred When Temp (°C) Above	Occurred When Wind Speed (m/s) Below
90	8.4	3.6
93	7.5	4
95	6.6	4.7
97	5.0	5.1
99	2.3	6
99.9	-1.0	7.6

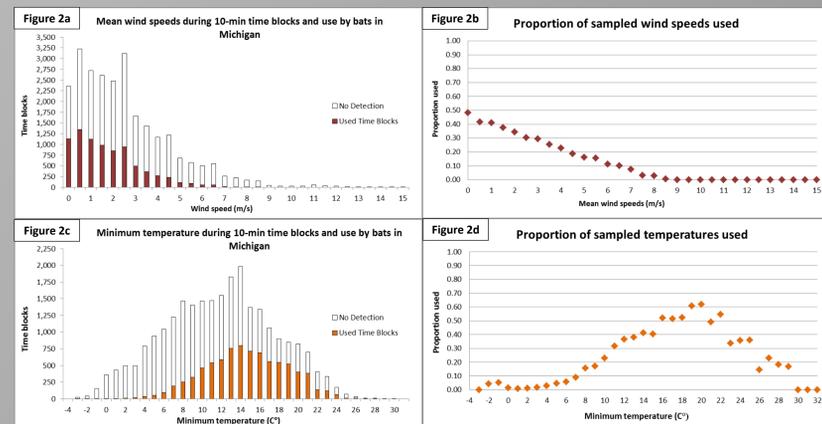
Bats appeared to use conditions disproportionately to their availability.



Weather station

The proportion of used time blocks decreased with increasing mean wind speeds (Figures 2a-b). Proportional use of time blocks also decreased when minimum temperatures were relatively low or high (Figures 2c-d).

We sampled less data when wind speeds were high or during extreme temperature conditions. Additional information about bat activity targeted at those conditions would be useful. Multiple years of site specific data could allow conservation measures to be tailored to a location. Further analysis of vocalization data would allow us to determine how groups of bats such as residents, regional migrants, and long-range migrants or species of concern use meteorological conditions.

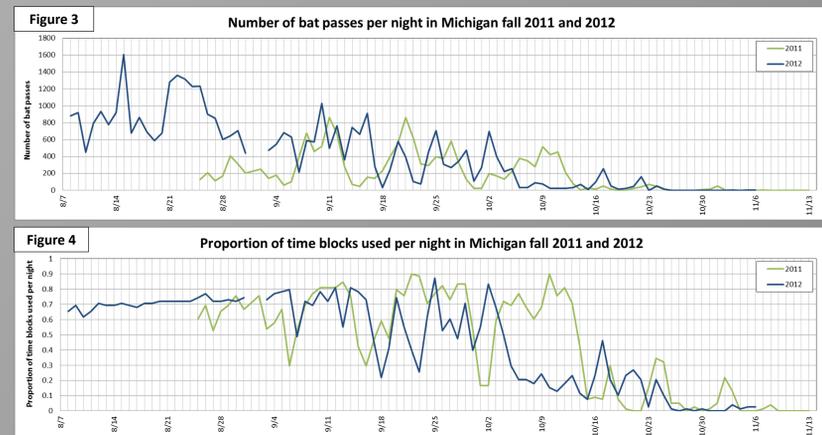


The duration of nightly vocal activity was similar between survey years.

Acoustic monitors provided an efficient means of documenting time periods with high activity and the duration of the migration season. In 2012, we found relatively high (Figure 3) and consistent (Figure 4) levels of bat activity in August at our sites in Delta county. We moved to sites in Huron and Iosco counties in September where found bat activity continued through early October when it dropped off. This reduction in activity was also seen at sites in Oceana and Huron counties in mid-October 2011. We expect activity periods and season length to show some variation with species, latitude, and year.



Myotis sodalis



Applications:

1. Develop conservation measures and tailor them to specific species or areas of interest.
2. Inform decisions on technical assistance letters (how a wind facility can avoid bat fatalities) and Incidental Take Permits (permitting limited take).
3. Further our understanding of life history patterns of migrating bats and facilitate meeting demands for renewable energy and sustained bat populations.

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² Use of trade names does not indicate endorsement by the U.S. Fish and Wildlife Service