



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

Great Lakes RESTORATION



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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?

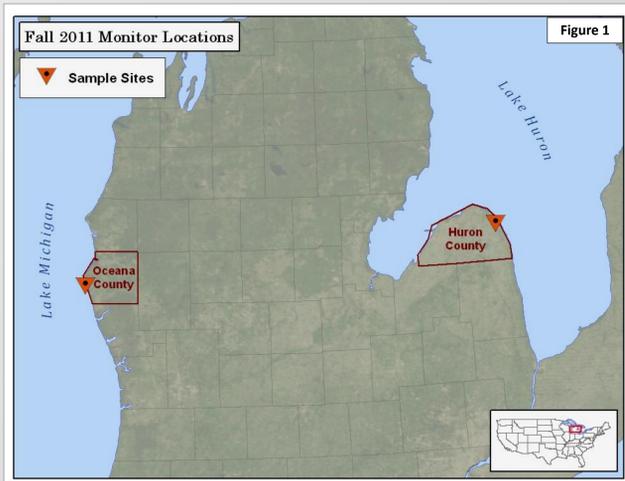
## Research questions:

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?

In an effort to provide timely information, our objective was to use data we had collected on all bat species to identify environmental conditions when activity was low. Our survey locations in Oceana and Huron counties were separated by more than 300 km and were located along a similar latitude (Figure 1). At each location we established two automated ultrasonic monitors (SM2BAT+, Wildlife Acoustics Inc.<sup>2</sup>) 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 WeatherLink<sup>2</sup>) and both weather and bat pass data were summarized in 10 minute time intervals. 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.



An ultrasonic/acoustic monitor



## Preliminary Results:

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

At our locations 99.9% of bat passes occurred when wind speeds were below 6.9 m/s. Temperatures were more variable (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.

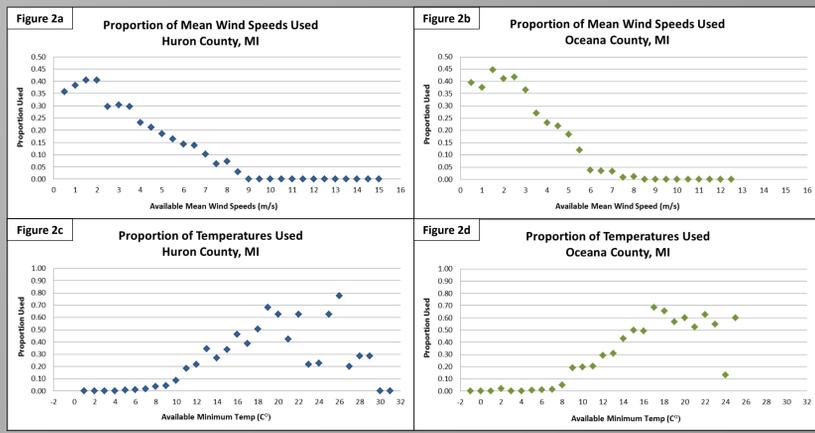
Percent of Bat Passes	Huron County, Lake Huron		Oceana County, Lake Michigan	
	Occurred When Temp (°C) Above	Occurred When Wind Speed (m/s) Below	Occurred When Temp (°C) Above	Occurred When Wind Speed (m/s) Below
90	12.7	4.5	11.2	4
93	12.2	4.7	10.2	4.2
95	11.6	5.1	9.7	4.5
97	10.4	5.6	9.0	4.9
99	9.2	6	8.1	5.4
99.9	6.8	6.9	6.0	6.9

### Bats used meteorological conditions disproportionately to their availability.



The proportion of available 10 minute time blocks that contained bat passes 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).

Trends at both locations were similar however some site specific variation was present. Regional conservation measures will need to be broad enough to include the range of variation associated with studies of this type. Although, with multiple years of site specific data conservation measures could be tailored to specific locations. Further analysis of vocalization data would allow us to determine how groups of bats such as residents, regional, and long-range migrants as well as individual species of concern use meteorological conditions.

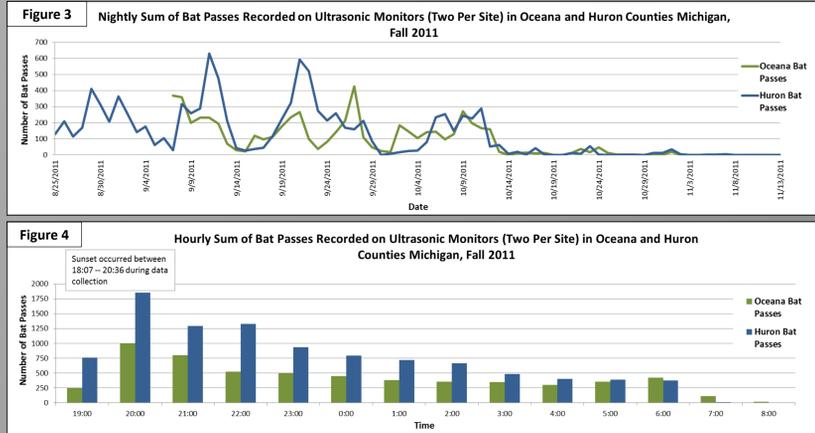


### Nightly vocal activity was similar between our surveyed locations.

The ultrasonic monitors provide an efficient means of documenting time periods with high activity and the duration of the migration season. Peak numbers for migration occurred at both sites between the middle and end of September but activity continued through the middle of October (Figure 3). Activity often coincided between the sites despite being located on opposite sides of the state. This similarity may be due to the shared latitude of the surveyed locations. We expect activity periods and season length to vary by species, latitude, and year.



The majority of bat activity occurred between 20:00 – 21:00 hours during dates when we collected data (Figure 4).



## 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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<sup>2</sup> Use of trade names does not indicate endorsement by the U.S. Fish and Wildlife Service

This project was part of a broader study presented in another poster and an oral presentation.