

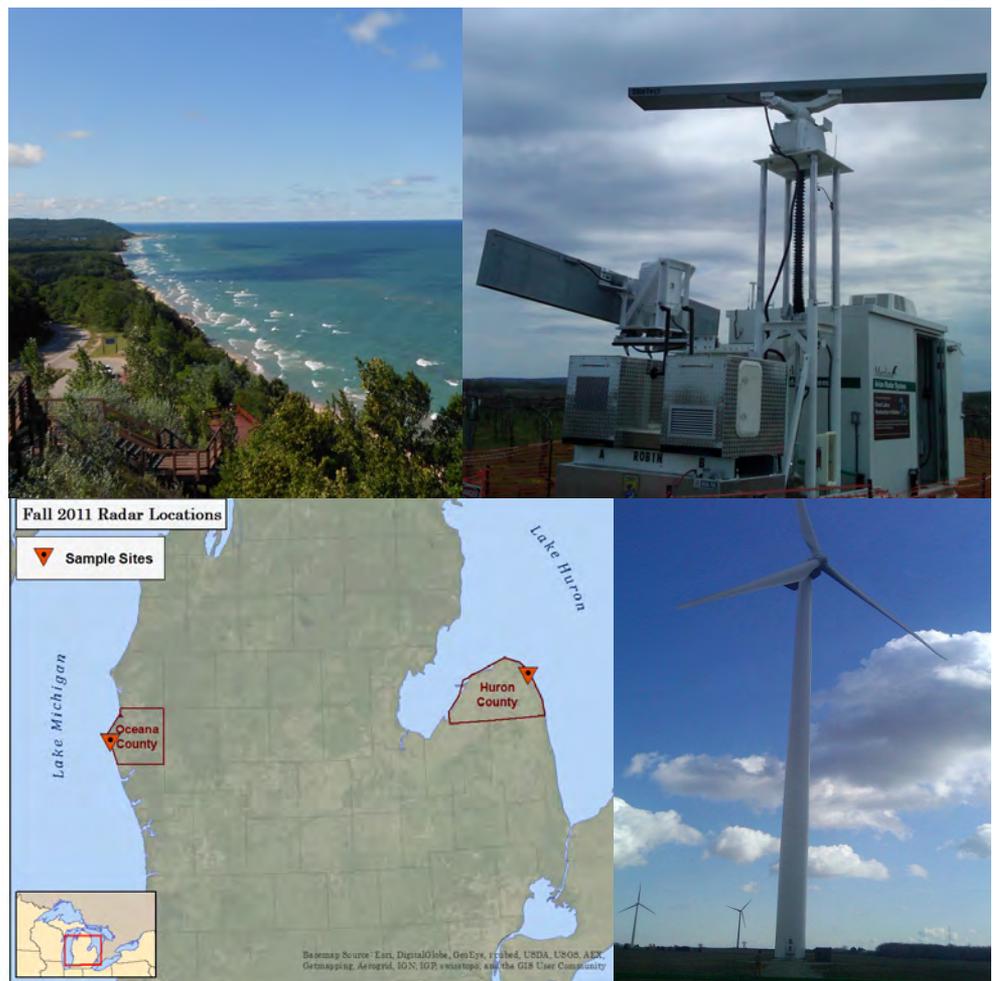


U.S. Fish & Wildlife Service

Great Lakes Avian Radar Technical Report Huron and Oceana Counties, MI

Biological Technical Publication

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Executive Summary

Global wind patterns help to move millions of migrating birds and bats through the Great Lakes region, where shorelines provide important stopover habitat. Shorelines are thought to concentrate migrants, as they offer a last refuge near a geographic barrier and are, most likely, used for navigation. Shorelines also offer attractive areas for wind energy development. With this potential for conflicting interests, more information is needed on the aeroecology of the Great Lakes shorelines. We used two avian radar systems to identify the activity patterns, timing, and duration of migration that occurred along shorelines of the Great Lakes.

We placed avian radar systems on shorelines on opposite sides of Michigan, where the automated systems tracked and recorded target (bird and bat) movements continuously from mid-August to mid-November, 2011. We calculated the direction of movement, target passage rates, and altitude profiles for the air space above our study areas. We also developed a model of our vertical sample volume that allowed us to report an estimate of target density by altitude band.

Migration appeared strong along the studied shorelines in Michigan. Mean nocturnal passage rates were greater than mean passage rates for dawn, day, and dusk combined at both of our locations. Nocturnal movement was typically oriented in a southerly direction, but we also recorded other behaviors associated with migrants such as reverse migration, dawn ascent, and migrants over water returning to land at dawn. Peak density occurred between 100 – 150 m above radar height; however, density may have been underestimated at higher altitudes.

The results of our research highlight the potential role of radar in implementing the Land-Based Wind Energy Guidelines and in identifying areas where impacts to wildlife would be minimized. We documented migration activity in the air space above our study areas and think the density of targets at low altitudes may present conservation

concerns. The data we collected demonstrated the ebb and flow of migration across the sampling period and showed that nocturnal peaks continued into November. Given the time periods during which migration occurred at the sampled sites, it appears that curtailing wind energy operations during nocturnal pulses could result in limited operational time along shorelines during the migration season. Combining the results of radar studies and fatality searches would greatly improve risk assessments and assist with interpretation of standardized radar studies.

Avian radar is increasingly relied upon to perform surveys for pre-construction risk analysis. While an important tool, few regulatory agencies have experience in implementing avian radar or recognizing the strengths and limitations of the technology. This report highlights several considerations about avian radar and reviews a number of potentially confusing metrics. We also introduce new metrics for reporting radar data. However, our analysis continues to evolve, and changes will be incorporated into our final report. In addition to providing information relevant to conservation in the Great Lakes region, the concepts we present in this report are widely relevant to reviews of avian radar studies and provide methods that identify components of migration, such as:

- Nocturnal pulses
- Season length
- Estimated density per altitude band
- Migrant behavior near a geographical barrier

Given the rapid growth of the wind energy sector, the most effective conservation efforts might be based on our ability to identify and avoid development in locations where migrants concentrate. Our use of commercial-grade avian radar to document migration and, in subsequent reports, to identify concentrations of activity is a broad-scale effort toward that end. To our knowledge, this effort represents the first of its type by the US Fish and Wildlife Service.