Mapping songbird migration patterns may help offshore energy be more bird-friendly

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A study published in the *Journal of Applied Ecology* revealed when, where and how most songbirds migrate offshore over North American coastal waters. This data offers a baseline to help wind energy managers

reduce fatal bird-wind turbine collisions while generating sustainable energy.

The researchers analyzed 10 years of weather radar data from 16 sites, from Maine to Florida and around the Gulf of Mexico to Texas. They found that offshore migration over the Atlantic coast and the Gulf of Mexico occurs in more concentrated pulses for a shorter time, compared to migration over land. The study also found more birds migrate in the fall than in the spring, including young birds making their first journey south.

"Offshore migration takes place in fewer nights than terrestrial migration because birds may be more selective about when to migrate over water," said Shannon Curley, the lead author of the study and a postdoctoral fellow at the Cornell Lab of Ornithology. "Large bodies of water lack places to rest and refuel, so birds may wait for ideal weather conditions, such as favorable winds, before making an offshore crossing."

This shorter yet critical window of time for the millions of birds migrating offshore each year may offer wind energy managers an opportunity to reduce collisions. They could pause turbine operation when migration is most intense—a practice that is currently more common in Europe than North America, according to Adriaan Dokter, a co-author of the study and a research associate at the Lab of Ornithology. He is also the leader of the BirdCast project, which uses weather radar data to monitor and predict bird migration in North America.

"These peak nights of migration tend to have fairly nice weather and calmer winds, and are therefore not the nights when wind operators have a huge energy harvest," Dokter said. "So there might be a sweet spot where we can target these big migration nights and give these birds safe

passage, with limited loss of energy."

The study also found that songbirds migrating offshore fly at lower altitudes than those migrating over land. Offshore migrants fly about 13% to 20% lower than their terrestrial counterparts, potentially putting them at greater risk of wind turbine collisions.

Offshore migration is common on both coastlines the researchers examined, with hundreds of millions of birds involved. However, the researchers found that more birds cross the western portion of the Gulf of Mexico in the spring and the eastern portion in the fall. This information may allow wind energy managers to adjust operations seasonally to reduce potential fatalities.

The number of bird fatalities reported at terrestrial turbines ranges from 140,000 to 327,000 in the U.S. annually, according to the U.S. Fish and Wildlife Service. The number of fatalities at offshore sites is unknown because of the difficulty in finding carcasses before they wash away, so using radar technology to identify high-risk areas is key, the researchers said.

Another study in 2015 estimated that terrestrial turbines accounted for less than 0.02% of mortality from all human-caused hazards, with outdoor cats and window strikes accounting for far more fatalities.

With one-third of all American bird species rapidly declining, according to the U.S. State of the Birds report, data-driven decisions about turbine siting and operations can point the way to sustainable energy while also saving birds, the researchers said.

"Our hope is that this work will help identify high-risk, high-use areas for birds and work toward positive green energy solutions," Curley said.

More information: Shannon R. Curley et al, Differences between terrestrial and offshore bird migration: Implications for offshore wind energy, *Journal of Applied Ecology* (2025). DOI: 10.1111/1365-2664.70158 besjournals.onlinelibrary.wile … 1111/1365-2664.70158

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