Wind Wildlife Research Fund

RESULTS SUMMARY

April 13, 2020

Landscape Factors Associated with Fatalities of Migratory Tree-Roosting Bats at Wind Energy Facilities: An Initial Assessment

A study supported by the Wind Wildlife Research Fund used bat fatality data from a unique database to identify associations between fatality rates of migratory tree bats at wind energy facilities and landscape-level factors.

Migratory tree-roosting bats make up approximately 72% of bat collision fatalities reported at wind energy facilities.[1] Understanding how large-scale ecological and geographical factors are associated with migratory tree bat fatality risk at wind facilities would help inform the wind industry's consideration of these variables when making facility siting and design decisions. However, few studies have been conducted to explore the relationships among these landscape-level factors and risk to bats from wind energy operations. The purpose of this study was to identify associations between migratory tree bat fatality rates at wind facilities and certain landscape-level factors, e.g. land cover, at various scales by analyzing bat fatality data from the American Wind Wildlife Information Center (AWWIC) database.

The full report is available online at www.awwi.org/resources/wwrf-landscape-factors-bats-2019.

STUDY OBJECTIVES

Researchers identified a dataset of almost 7,000 fatality records for hoary, eastern red, and silver-haired bats, three migratory tree bat species that comprise approximately 72% of all bat fatalities contained in AWWIC. This dataset represented post-construction fatality monitoring (PCFM) studies from 42 wind energy facilities in U.S. Fish and Wildlife Service (USFWS) Legacy Regions3 (Midwest) and 5 (Northeast).[2] Through a literature review and consultations with AWWI and subject-matter experts, the authors identified 55 relevant landscape metrics (e.g., land cover types) to be calculated at four different scales (turbine area and 2.5 km, 5 km, and 25 km buffers around the wind facility). A set of models was constructed to predict bat fatalities for each species and Region, modeling bat fatality rates as a function of up to three of the independent landscape metrics. The goal of this work was not to identify a single best model to be used for predicting fatality rates for each species and Region, but rather to identify the key variables that could influence the number of bat fatalities and the relative relationships between bat fatalities and these variables.

KEY TAKEAWAYS

- The factors that influenced fatality numbers differed among Regions and species.
- Findings indicated that landscape metrics at broad spatial scales (25 km) may be important predictors of fatality risk.
- Fatalities of all species in both Regions were higher at facilities with greater urbanization (percentage of developed land) within 25 km.
- Fatalities in both Regions also appeared to be associated with wetland configuration, with increased risk in areas with wetland complexes comprising multiple small or mixed large and small wetland patches.
- The study results show the value of the project's approach to improving understanding of variation in bat collision risk among wind energy projects by analyzing landscape-level variation in fatality data among existing wind energy facilities.

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NEXT STEPS

- Future PCFM studies should follow standard monitoring protocols and use a common estimator, such as GenEst, to reduce errors in measurement and increase comparability among results.
- Bat risk assessments for potential wind energy facilities in USFWS Legacy Regions 3 and 5 may be more robust if they factor in features within the broader landscape (i.e., 25 km or more) and consider urbanization (both Regions), open landscape configuration (Region 3), and wetland coverage or configuration (both Regions).
- Additional studies at more sites, and in different Regions, evaluating similar variables are recommended to improve understanding of the relationship between land cover features and risk to bats from wind energy facilities.

STUDY RESULTS

The factors that influenced risk differed among Regions and species. Most of the parameters most strongly association with higher bat fatality rates represented landscape characteristics calculated at the broadest scale examined (25 km). Fatalities of all species in both Regions were higher at facilities with greater urbanization within 25 km, and also appeared to be associated with wetland configuration. Eastern red and hoary bats appear to have been at increased risk in areas with wetland complexes comprising multiple small or mixed large and small wetland patches. At the 25 km scale, silver-haired bat fatalities increased with distance from the nearest stream or river. Additional factors calculated at smaller spatial scales emerged as potential predictors for USFWS Legacy Region 3: at the turbine area scale, fatality rates of all three species tended to increase with road density; and hoary and eastern red bat fatality rates were higher when turbine areas contained small disaggregated patches of open, non-cultivated habitat as opposed to clumped, larger patches.

CITATION

Peters, K., I. Evans, E. Traiger, J. Collins, C. Mathews, A. Klehr. 2020. Landscape Factors Associated with Fatalities of Migratory Tree-Roosting Bats at Wind Energy Facilities: An Initial Assessment. AWWI Technical Report. Washington, DC. Available at www.awwi.org. This report is the second product of the Wind Wildlife Research Fund.

[1] See AWWIC Technical Report, A Summary of Bat Fatality Data in a Nationwide Database, https://awwi.org/resources/awwic-bat-technical-report/

[2] In late 2019, USFWS implemented reorganized Department of Interior Regions: https://www.doi.gov/employees/reorg/unified-regional-boundaries. Legacy Regions refer to the Regions used by USFWS before this change: https://www.fws.gov/ecological-services/about/contacts.html.