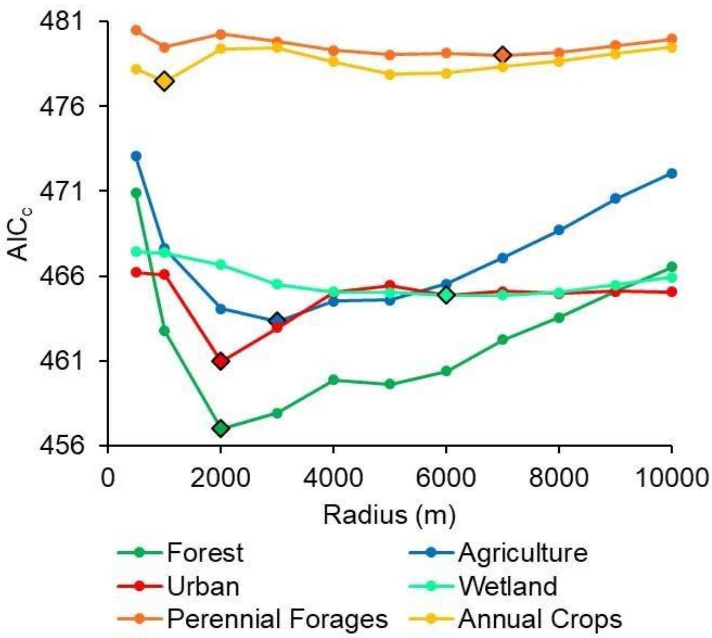
Appendix 1

Scale of effect analysis

In ecology, the scale of effect is the spatial extent of the landscape that has the strongest effect on a species response (Brennan et al. 2002, Jackson and Fahrig 2015). The scale of effect can be empirically calculated using a focal site multiscale study design where an ecological response (such as occupancy or abundance) is measured at each site and the landscape structure (such as proportion of habitat amount) is measured at multiple spatial extents around each focal site (Jackson and Fahrig 2015). In this study, we identified the scale of effect as the spatial extent with the lowest small-sample Akaike Information Criterion (AIC_c) value for an ecological response. Other coefficients, criterion or indicators may be used to determine the scale of effect (Jackson and Fahrig 2015).

In our study we determined the appropriate landscape scale using a threshold-based method (TBM). However, some studies argue that the TBM is oversimplified because it assumes that the effect of the landscape variable on the response variable is the same at every point within the scale of effect (i.e. up to the threshold; Miguet et al. 2017). An alternative to the TBM is the distance-weighted method (DWM) that measures distance-weighted landscape variables from the measured response (Chandler and Hepinstall-Cymerman 2016, Miguet et al. 2017). In a study by Miguet and colleagues (2017), the authors compared TBM and DWM using real datasets and found that although the DWM may improve model support, model fit using AIC and R^2 values between TBM and DWM were not significantly different (Miguet et al. 2017). The study by Miguet and colleagues (2017) also highlighted that the TBM may underestimate the area required for landscape management in comparison to the DWM. Although DWM may improve the TBM, the DWM is relatively new and not very commonly used. In our scale of effect analysis, we have used TBM because it is more commonly used and model fit is relatively similar to DWM. Since our scales may underestimate the area required for conservation, we do not emphasize the scale required for conservation other than the relative size (i.e. small vs large).

We empirically evaluated the scale of effect by selecting the spatial scale with the lowest AICc values for forest, agriculture, wetlands, urban, cropland and perennial forages at all 11 spatial scales (500m, 1000m, 2000m, 3000m, 4000m, 5000m, 6000m, 7000m, 8000m, 9000m 10000m). The scale of effect for landscape composition measures for whip-poor-wills were 2000m for proportion forest cover, 3000m for proportion agricultural cover, 6000m for proportion wetlands and 2000m for proportion urban (see figure S1). Within the agricultural category, the scale of effect for whip-poor-wills for cropland was 1000m and 7000m for perennial forages. Thus, for whip-poor-wills we used forest cover at 2000m, agriculture cover at 3000m, wetlands at 6000m, urban at 2000m, cropland at 1000m and perennial forages at 7000m in all models.



S1 - Scale of effect analysis of Eastern Whip-poor-will occupancy versus proportion of forest, agriculture, wetland, urban, cropland and perennial forages at various scales (radii in m). Scale of effect indicated by diamond (black outline).