

Edge effect in winter bird communities of fragmented suburban forests

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Abstract

Suburban areas in the mid-Atlantic region typically include many small forest fragments due to the combination of an increasingly built environment plus secondary forest succession on previous agricultural lands. This high frequency of forest fragments results in a large amount of edge habitat, with concomitant edge effects on many species. The edge effect predicts that bird abundance and species richness will be greater in the border between two habitats than in either interior because of unique environmental conditions and higher plant abundance and diversity in the edge. Additionally, in suburban forests, deer overabundance has resulted in a sparse shrub layer, which is an important food and shelter source for wintering birds in the forest interior, and so may augment the edge effect on winter bird communities. I censused winter birds by point count in the edges and interiors of two suburban forests in central New Jersey to determine whether there was an edge effect in forests under intensive deer pressure. Preliminary results revealed significantly greater abundance ($t = 2.21$, one-tailed $P = 0.03$, $n = 8$) and species richness ($t = 2.21$, $P = 0.03$, $n = 8$) in the edge habitat. Further study will determine whether different relative deer pressures influence the amount of edge effect in the winter bird community, with the goal of understanding how human activity participates indirectly in forest ecosystems.

Introduction

- Suburban forests provide a platform for interaction between natural ecosystems and humans. Human activity influences the temperate deciduous forests of the northeast United States through anthropogenic edges and high deer abundance. These properties of forest plant communities also affect wintering bird communities.
- The edge effect is a culmination of abiotic and biotic features, including microclimate conditions and plant density, and predicts that bird species richness and abundance is higher within 50 m of the edge than in the interior.
- Edge effect has been found to be more pronounced in shrubby edges than in nonshrubby edges. Shrub cover in the forest interior is negatively affected by deer pressure, suggesting that the edge may be more valuable in higher deer pressure forests.
- Winter birds are expected to show a pronounced edge effect because they are more sensitive to temperature and windspeed that shrubs provide shelter from, and are dependent on shrubs for fruit. While breeding birds have the complications of territory and nesting, winter birds are focused on survival and choose their habitat accordingly.
- I hypothesized that edge habitats would have higher winter bird richness and abundance than interior habitats.

Methods

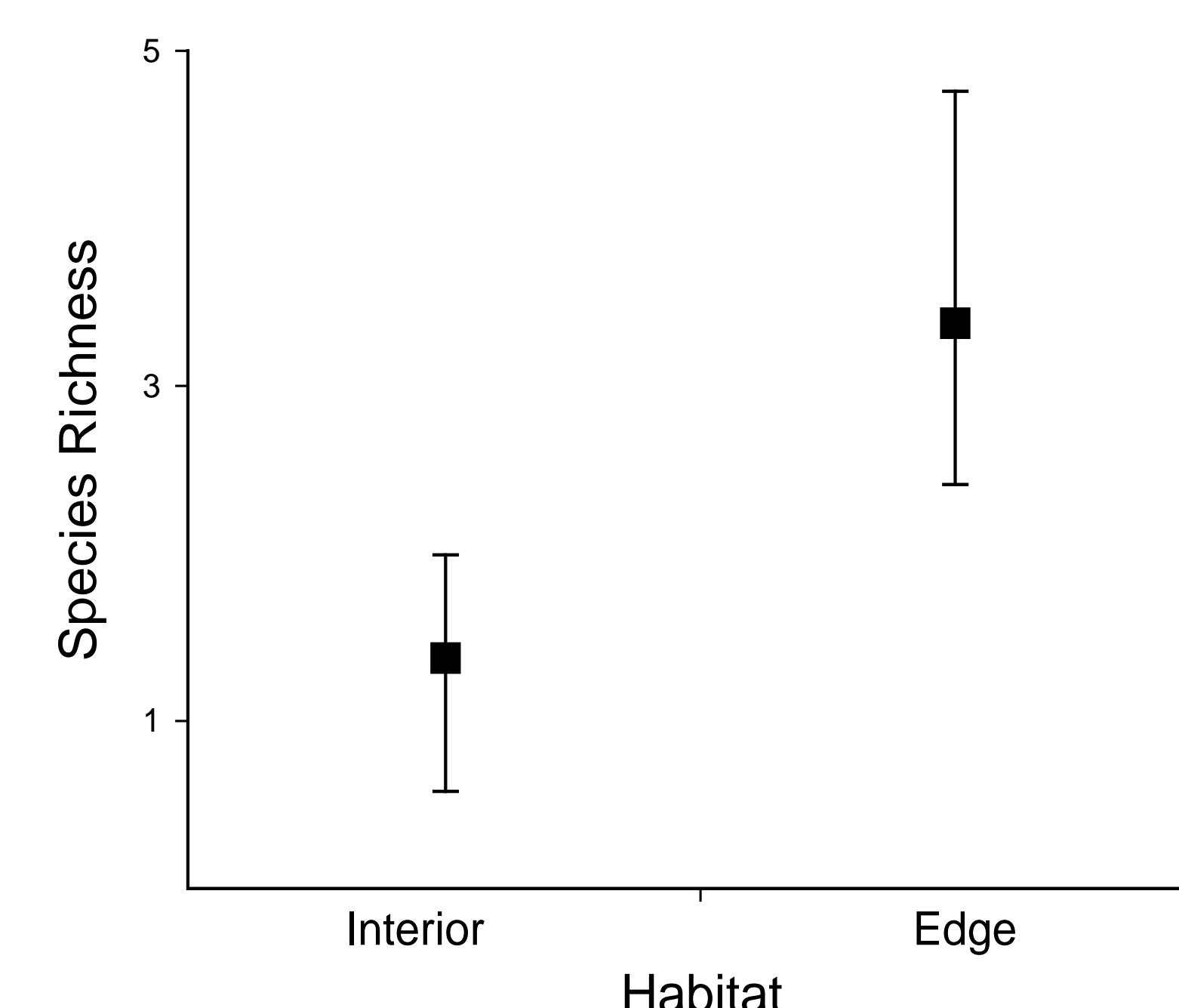
- I conducted point counts along four transects in two forests, perpendicular to the edge between forest and meadow. Each transect had two 40 m-radius points where point counts are conducted, one centered on the edge and one 120 m interior.
- Point counts consisted of recording all birds seen or heard within the circle for 5 minutes. They were conducted between February 3 and March 3 on days with no precipitation and windspeed below 13 mph. When the dawn temperature was above-freezing, counts were conducted at dawn; when below-freezing, counts were conducted 1.5 hours later. Each day one transect was counted, alternating day by day from edge-first to interior-first.
- Species richness and abundance were calculated for edge vs. interior habitats using a one-tailed paired t-test.

Results



Average abundance (\pm 95% CL) of birds in edge and interior habitats of two forests.

The edge habitat had higher abundance than the interior habitat ($t = 2.21$, one-tailed $P = 0.03$, $n = 8$).



Average species richness (\pm 95% CL) of birds in edge and interior habitats of two forests.

The edge habitat had higher abundance than the interior habitat ($t = 2.21$, $P = 0.03$, $n = 8$).



Shrubby meadow-forest edge versus forest interior.

Discussion

- The edge effect suggests that the edge is a higher quality habitat than the forest interior for winter birds. This is likely because the edge retains a shrub layer that is dwindling in deer-abundant forests.
- Excluding unknowns, all interior counts pooled contained six different species while edge habitats contained thirteen, including all six interior species. Many edge-only species, such as the white-throated sparrow, favor shrubby habitat.
- Further study should examine the difference in the degree of edge effect in lower deer pressure forests and higher deer pressure forests. The edge effect is expected to be higher in higher deer pressure forests, where low shrub cover makes the interior lower quality habitat than in lower deer pressure forests.
- Migrant birds are threatened by habitat loss and fragmentation along migration routes. Determining high quality habitat is important for management of these species.



White-throated sparrows (left) were only found in the edge, while red-bellied woodpeckers (right) were found in both habitats.



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