

Foraging preferences for different tree species by downy woodpeckers, hairy woodpeckers and red-bellied woodpeckers in a floodplain forest (Ramapo Valley County Reservation, NJ)

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Introduction

- Studies suggest that woodpeckers often forage more heavily on tree species that are experiencing wood-boring insect outbreaks (Flower et al., 2013, and Hammond and Theimer, 2020).
- In the past few years, an invasive emerald ash borer (*Agrilus planipennis*) outbreak has been leading to the decline and death of the majority of white ash trees (*Fraxinus americana*) in the New Jersey Highlands (<https://www.nj.gov/agriculture/divisions/pi/prog/emeraldashborer.html>).
- The purpose of this study was to examine the tree species foraging preferences of three common woodpecker species in a floodplain forest where many white ash trees are being impacted by an emerald ash borer outbreak.

Objectives

The overall objective was to evaluate downy woodpecker (*Dryobates pubescens*), hairy woodpecker (*Dryobates villosus*) and red-bellied woodpecker (*Melanerpes carolinus*) foraging preferences for the different tree species present in the study forest. Specific objectives were to:

- determine whether foraging preferences were similar for the three woodpecker species;
- compare tree species preferences in this data set with those observed in a similar study for red-bellied woodpeckers at the study site several years before the emerald ash borer outbreak;
- consider the impact that the decline of the white ash tree population may have on the woodpecker species in the study.

Methods

- Study area: a floodplain forest at the Ramapo Valley County Reservation, Bergen County, New Jersey
- Point-Quarter Tree Survey:
 - At each of the 18 survey points (Figure 1):
 - one tree per quadrant (total n = 72 trees)
 - Tree species were identified, trunk diameter was measured and basal area was calculated for each tree.
 - 11 different tree species were encountered - listed from most to least common:
 - white ash (*Fraxinus americana*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), slippery elm (*Ulmus rubra*), black cherry (*Prunus serotina*), pin oak (*Quercus palustris*), winterberry holly (*Ilex verticillata*), Eastern redcedar (*Juniperus virginiana*), black walnut (*Juglans nigra*), muscledwood (*Carpinus caroliniana*), red oak (*Quercus rubra*)
 - Woodpecker Species: downy woodpecker (*Dryobates pubescens*), hairy woodpecker (*Dryobates villosus*), and red-bellied woodpecker (*Melanerpes carolinus*)
 - Bird observations on 18 field days, November 2 - December 19, 2021.
 - Time spent foraging and tree species were recorded for each tree on which a woodpecker was observed foraging.
 - downy woodpecker (n = 127 tree selections)
 - hairy woodpecker (n = 153 tree selections)
 - red-bellied woodpecker (n = 186 tree selections)
 - Chi-Square analysis was used to statistically compare the relative time spent foraging on each tree species and the expected foraging time as predicted by the relative basal area of each tree species.

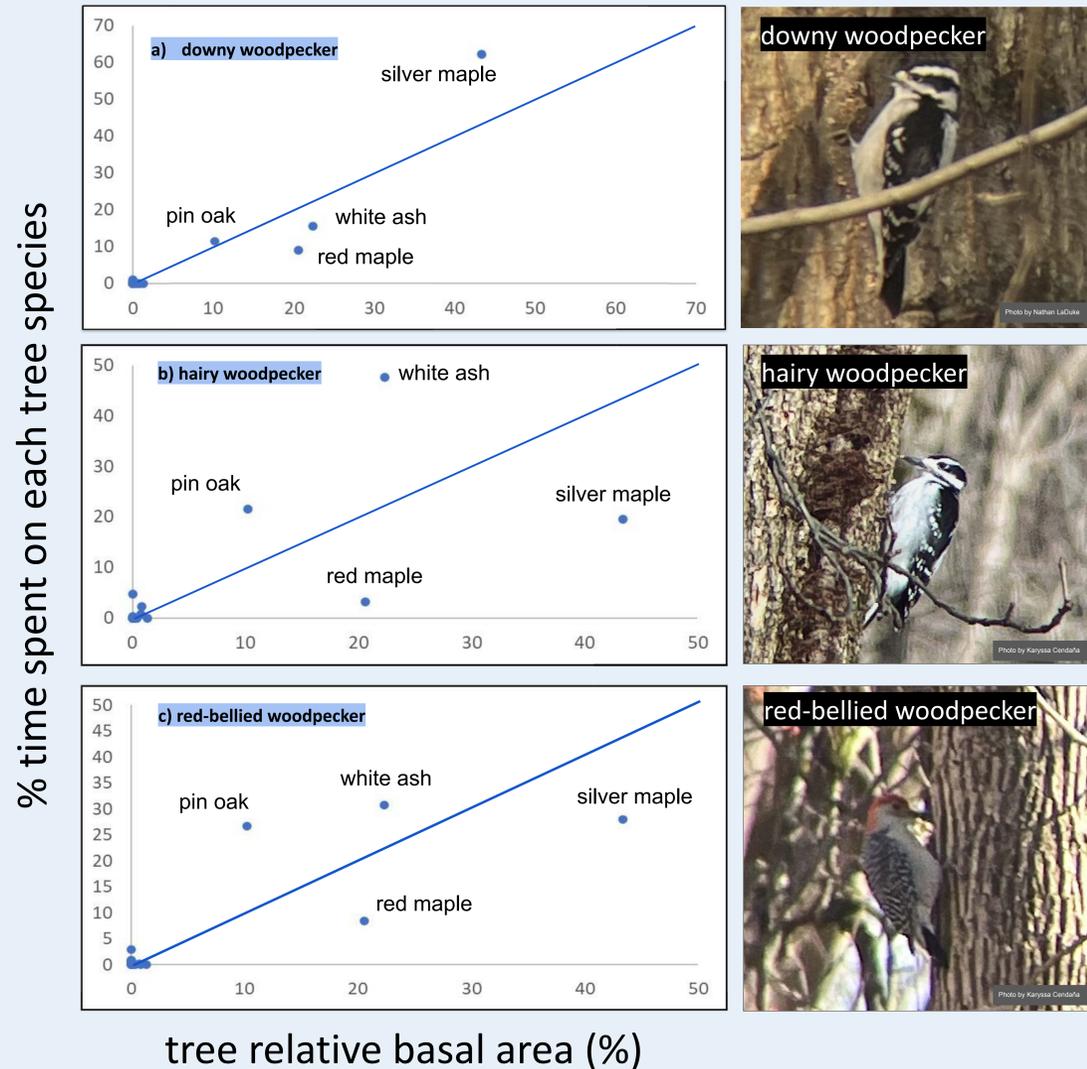


Figure 3. Relative basal area, which serves as a proxy for volume of space occupied, for each tree species in the point-quarter survey versus percentage of time spent by each woodpecker species foraging on each tree species. The diagonal line in each graph represents a 1:1 ratio (i. e., random foraging).

Fig 1. Eighteen tree survey points in the Ramapo Valley County Reservation.



A section of forest dominated by dead and dying white ash trees.



Tree Species	2013 (% time)	2021 (% time)
silver maple (<i>Acer saccharinum</i>)	27.7	28.9
red maple (<i>Acer rubrum</i>)	9.7	8.7
river birch (<i>Betula nigra</i>)	2.6	3.1
white ash (<i>Fraxinus americana</i>)	28.0	31.7
pin oak (<i>Quercus palustris</i>)	28.4	27.6
slippery elm (<i>Ulmus rubra</i>)	3.6	0.0

Table 1. The percentage of time spent on each tree species by red-bellied woodpeckers in Fall, 2013 (pre-outbreak) and in Fall, 2021 (outbreak).

Results

- For all three woodpecker species, most foraging occurred on four tree species: silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), white ash (*Fraxinus americana*), and pin oak (*Quercus palustris*). (See Table 1.)
- Foraging preferences and avoidances for different tree species were as follows:
 - Downy woodpeckers spent statistically significantly more time on silver maples ($p < 0.05$) and significantly less time on red maples than expected ($p < 0.05$). See Fig. 3a.
 - Hairy woodpeckers spent significantly more time on white ash and pin oak ($p < 0.05$), and significantly less time on silver maple and red maple than expected ($p < 0.05$). The data revealed particularly strong preference for white ash (47.6 % of the foraging time). See Fig. 3b.
 - Red-bellied woodpeckers spent significantly more time on pin oak ($p < 0.05$) and significantly less time on red maple and silver maple than expected ($p < 0.05$). See Fig. 3c.
 - These foraging preferences were remarkably similar to the preferences seen in a similar study on red-bellied woodpeckers at the study site in 2013 (Table 1).

Discussion

- Results suggest that downy woodpeckers are the most specialized in terms of the tree species on which they forage, with strong preference for silver maple. Clearly, downy woodpeckers were not focusing on emerald ash borers, which are found exclusively on ash trees. It is possible that the borers are too large in the autumn to be consumed this small woodpecker species.
- Hairy woodpeckers and red-bellied woodpeckers spent significant time on white ash trees. While both of these woodpecker species may be responding to increased food resources on ash trees in the form of emerald ash borers, the nearly identical foraging trends for red-bellied woodpeckers between 2013 (pre-outbreak) and 2021 (outbreak) suggest that their foraging preferences might be impacted by factors other than emerald ash borers.
- Given that hairy woodpeckers so strongly favor foraging on white ash trees, they may be particularly vulnerable to the dramatic decline of the ash population that is being caused by the emerald ash borer outbreak. Additional research is warranted to determine whether hairy woodpeckers are adjusting their foraging behavior in response to emerald ash borer abundance or if they are simply more adapted to foraging on ash trees. Given that hairy woodpeckers are less common than the other two woodpecker species in the study, better understanding of their foraging behavior could be particularly important for their long term conservation.
- Despite the intense foraging on ash trees by hairy woodpeckers and red-bellied woodpeckers, it doesn't appear that the resulting predation is diminishing the emerald ash borer outbreak at the site.
- Overall, this study revealed different foraging preferences among the three woodpecker species. Future studies should examine the mechanisms behind foraging decisions and the implications of declining ash tree populations for the woodpecker species that forage heavily on ash trees. Similar studies should also be conducted in different forest tracts and at different times of the year.

Acknowledgements

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Literature Cited

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