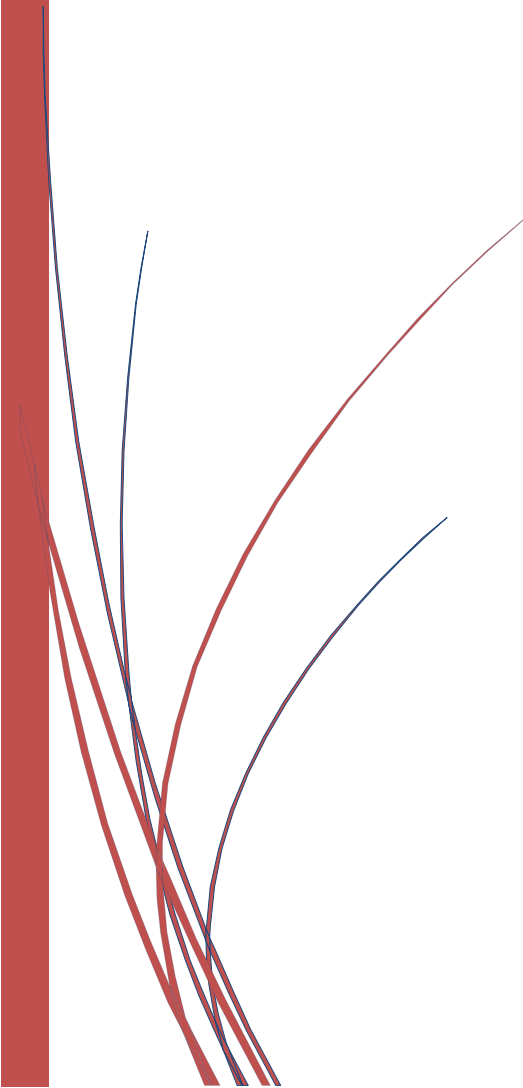




10/20/2022

The Red-headed Woodpecker: A Comprehensive Nest-site Study

ENVL 4300 - Environmental Issues
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Abstract

Over the past three decades, the Red-headed Woodpecker (*Melanerpes erythrocephalus*) has seen significant declines in population. With the population status of this species reaching threatened in multiple states across the eastern United States, extensive research has been conducted to better understand this decline and the efforts that can be made to help regain population levels. This paper investigates the effectiveness of existing nest boxes installed on Stockton University's Galloway campus and contains recommendations for potential future nest-box locations on campus. The final conclusions and recommendations were made with consideration of the researched habitats and behavioral ecology of the species.

Introduction

The Red-headed Woodpecker (*Melanerpes erythrocephalus*) plays a key role in the ecosystem it lives in. They control insect populations by preying on certain species and may help to disperse seeds of various plants that they both eat and store. They also play a significant role in providing shelters for other cavity-nesting birds and mammals that are not able to excavate their own tree holes (Wisconsin Dept of Natural Resources, 2013). There is an aesthetic aspect of the Red-headed Woodpecker as well, with the stark red plumage of the male individuals (as their name refers to) that appeals to bird watchers and nature enthusiasts, as the species has been seen on NJ license plates and other decals (Appendix A). The abbreviation for the red-headed woodpecker is RHWO and will be referred to as such throughout this paper (Klimkiewicz & Robbins, 1978).

According to the Conserve Wildlife Foundation of New Jersey (2022), the RHWO was declared a threatened species in New Jersey in 1979, although a population status on the federal level has never been listed. Across the past three decades, this species has experienced significant declines in population within its habitat range from a mixture of factors including predation, competition, climate change, and human interference. A study performed in 2017 investigated four distinct factors that may have shown stronger contributions to this decline than others; the results showed that increased predation and the effects of significantly warmer winter temperatures had the largest effects on the RHWO population (Koenig, 2017). Another study on daily nest survival rates in New York also found that the overall survival rates of RHWO were low, with the leading cause of nest failure being predation at 82% (Berl et al, 2014). The typical nest sites in southern New Jersey include mostly upland oak and/or pine forests as overstory, with a fair number of dead felled trees and lowbush ground cover of blueberry or huckleberry (Conserve Wildlife, 2022). The RHWO ideal habitat, however, can vary by geographical location across the eastern United States; the species' full range for breeding and wintering can be seen in Figure 1.

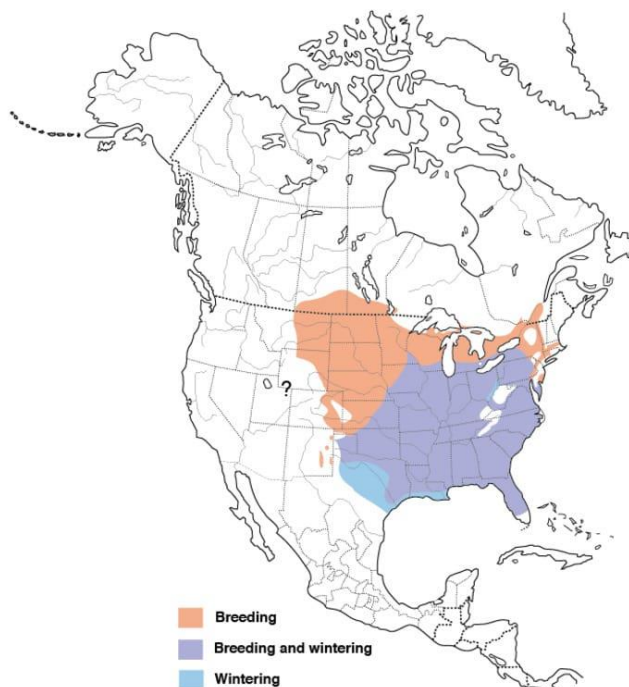


Figure 1: Breeding and wintering range map for red-headed woodpeckers (*Melanerpes erythrocephalus*)

The RHWO is an omnivore, with one-third of its diet consisting of animal materials (insects, bird eggs/nestlings, occasionally mice or small bird species), and two-thirds plant material (nuts, corn, cherries, seeds). They are one of the most skilled flycatchers of woodpecker species, catching insects mid-air that they spot from a perched position. They also dutifully cache live insects, nuts, fruits, and other foods for consumption during winter months (Cornell, 2022). The RHWO is strongly aggressive, particularly when defending food storage sites, and is interspecifically territorial against the Red-bellied Woodpecker (*M. carolinus*), however they have differentiation nesting sites that reduce aggressive encounters (Reller, 1972).

Current Nest Sites

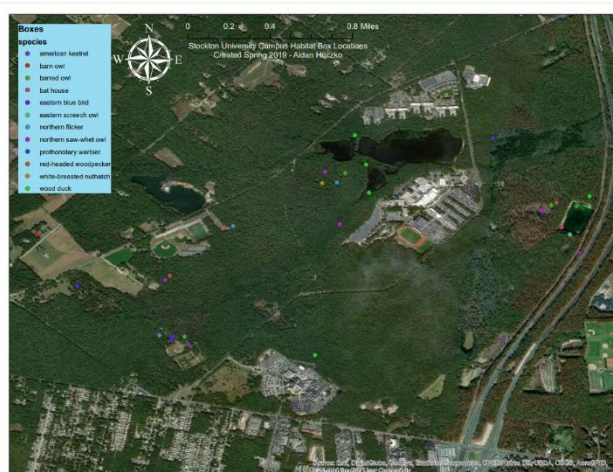


Figure 2: Map of wildlife habitats on Stockton's campus. Red-headed woodpecker nest boxes are depicted in burnt orange.



Figure 3: Nest box 1 located in Stockton University's Forest Management area.



Figure 4: Understory of Nest Box

There are currently two RHWO nesting sites on Stockton University's campus (Figure 2). One is located west of Lake Pam within the forest management area, and the other is located south of the school's baseball field. The forest composition of both sites is oak-pine upland forest (Moscovici, 2019) with densely vegetated understories. The first nest box in the forest management area is situated on top of a pole roughly 10 feet off the ground. There is no predator guard on the pole, and it is unclear if the box was successfully

used given that we are in the non-breeding season. However, there does not seem to be any damage to the box itself. The understory consisted of bayberry shrubs and other vegetation roughly 2 ft tall (Figures 3 and 4). The second nest box adjacent to the baseball field is also positioned on top of a pole, however the box itself was damaged and bent parallel to the ground. It is unclear what caused the disturbance. There is a predator guard on the pole that would have prevented

access to the box, but at the base of the pole is an active mammal burrow, likely inhabited by a groundhog

or other small mammal. The understory brush has a significantly higher density with the vegetation reaching over 5 ft tall (Figures 5 and 6).

We determined that the current nesting sites on campus are not situated in the most effective habitats for this species. Both habitats have downed coarse woody debris (DCWD) of dead trees and snags, which is one of the most important habitat components for the RHWO (Lohr et al, 2002), however



Figure 5: Nest box 2 located by Stockton's baseball field and surrounding brush.



Figure 6: Mammal burrow at base of Nest Box 2.

they prefer cleared or sparse understory vegetation (Conner, 1976) at their nesting sites. To maximize the efficiency of these nest boxes, the bayberry and other shrubs would need to be cleared, with the downed trees and snags left behind.

Potential Nest Sites

Building new habitat for species experiencing habitat decline is incredibly important for preserving populations. While considering the factors that make up a suitable habitat for Red-headed Woodpeckers, we created a suitability model using ArcGIS Pro to select potential habitat sites on Stockton University's campus. Spatial data from 2007 containing land use and cover information in Atlantic County, and more specifically, Stockton University, was used to classify on-campus land by land use type. Plots were categorized as Agriculture, Barren, Forest, Urban, Water, or Wetlands. Nesting habitat studies have concluded that RHWOs tend to choose old mature oak-hickory wood lots with only grasses and forbs as ground cover for their nesting sites and will nest whether the tree's trunk or limbs are dead or alive, but they show preference for dead wood (Conner, 1976). Based on this information, we isolated plots of lands that fell under the Forest category. Nickley & Bulluck (2019) also found that when canopy cover of forest patches exceeded ~85%, patch occupancy abruptly dropped. RHWOs tend to select patches with an intermediate amount of canopy cover and are selective to forest patches with a mix of coniferous trees (Vierling, 2006). We used this information to further narrow potential nest sites and selected out mixed forest lands made of >50% coniferous trees with 10-50% crown closure.

This preliminary spatial analysis would show all potential forest land for a new nesting site; however, it would not account for what RHWOs require from the area surrounding their nesting habitats. Open areas adjacent to woodlots used for nesting are an important aspect of the nesting habitat because

woodpeckers spend a lot of time foraging in these open areas. Old mature woodlots bordered by open areas provide opportunities for flycatching, extensive ground access for foraging, and an abundance of nest sites in old trees. Because the woodpeckers also spend the winter in the woodlots where they nest, the woodlots and surrounding open areas fulfill winter foraging requirements as well (Conner, 1976). Therefore, sites are not required to be next to bodies of water, but they would be most suitable near open areas. The resulting map shows the two most suitable areas for a new RHWO nest, with the plot by AtlantiCare Medical Center being the most suitable out of the two, due to its distance away from existing nest locations, reducing chances of competition (Figure 7 and Appendix B).

Red-headed woodpeckers prefer a mature oak savanna habitat with scattered trees and tend to choose dead trees with little to no bark (Ingold, 1994). Therefore, a successful artificial nest box should be made with a mature oak log, measuring at least ten inches in diameter. The log should be cut directly in half, then the inside of the log must be hollowed out to create the nest cavity. Cavity entrances should not be excessively large, just large enough for the woodpecker to fit inside (Ingold, 1994). The cavity should resemble a bulb, about six inches deep, as woodpeckers will lay their eggs in a space that is enclosed and provide protection to their young. The log may then be reconnected with hinges to allow future use (Appendix C). Woodpeckers prefer freshly excavated nests so wood shavings should be placed inside the nest cavity (Ingold, 1994). Hooks and latches will need to be added to hang the artificial nest and ensure it stays closed. It is important to keep in mind where the artificial nest will be located because while nest cavity height is maximized in shorter trees, it varies widely as nest tree height increases (Nickley, 2019). Nest cavities in southwestern Virginia were found mostly in white oak trees, at an average of 17.5 m above the ground

Suitable Nesting Sites for Red-Headed Woodpeckers

Created by Mani Arango at Stockton University, 2022

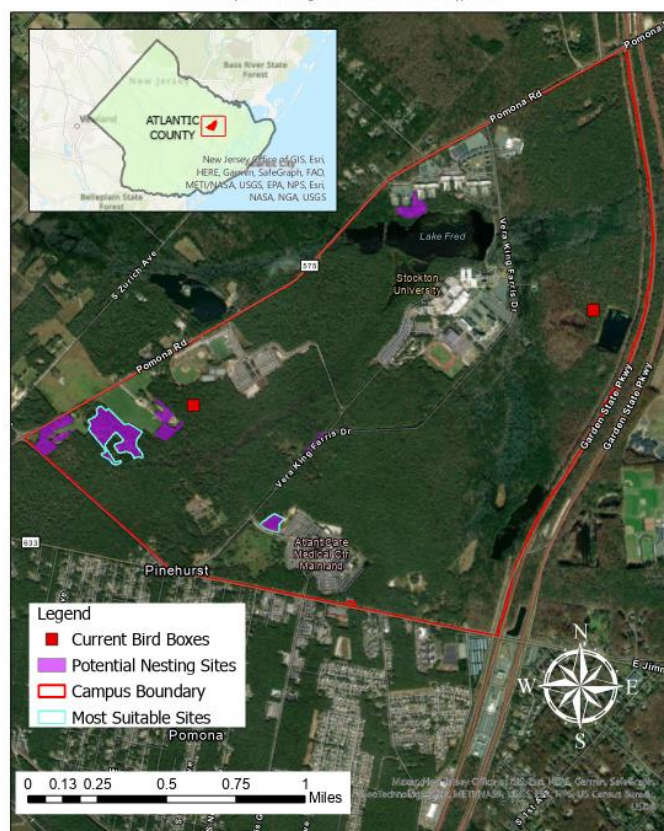


Figure 7: Map showing viable nesting sites for RHWOs within Stockton University's campus boundaries. Potential nesting sites consist of mixed forest land with low crown cover and the most suitable sites are near open areas or fields.

(Conner, 1976), reducing the chance of small or medium sized mammals and other invertebrates climbing up into the nest.

New Jersey is one of the Red-headed Woodpecker's breeding areas within its range, but they migrate west/southwest to overwinter. The best time to monitor the nest boxes for activity at our potential nest sites would be during their breeding season in the spring and early summer, such as in the study conducted by Berl et al (2014).

Conclusion

Overall, the Red-headed Woodpecker populates an extensive range of land with differing landscapes and plant material to inhabit, but still continuously faces various threats to its survival. By conducting this analytical review of the most successful habitats and nesting sites for RHWO, we concluded that the existing nesting boxes on Stockton University's campus may not be maintained well enough or located in areas that are the most appealing for RHWO to inhabit. If additional nesting boxes on campus were to be implemented in the future, reviewing this study and its findings could help to optimize inhabitants and overall population growth on campus.

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Appendix

Appendix A: Red-headed woodpecker license plates and stickers from NJ Fish and Wildlife programs



Appendix C: Blueprint diagram illustrating the size and structure of a potential woodpecker nesting box.

