Introduction

- Avian cavity nesting species are classified as either primary or secondary cavity nesting species. Primary cavity nesters excavate their own cavities, while secondary cavity nesters occupy existing cavities created by primary species or naturally occurring events.
- The removal (timber, agricultural) of hardwoods and forest stands has resulted in a loss of habitat and nesting sites for cavity nesters. Artificial nest boxes can be effective in mitigating losses in landscapes with little forest cover (Lowrey and Holm, 1989).
- Target species for this study were Falco sparverius (American Kestrel), as well as the 3 species of secondary cavity nesting waterfowl: Air sparrow (Wood Duck), Lophodytes cucullatus (Hooded Merganser), and Bucephala clangula (Common Goldeneye).
- Target species utilize artificial nest boxes, although most nest in natural tree cavities.
- Natural tree cavities, suitable for nesting wildlife, are most likely to occur in mature hardwoods > cavities > young hardwood species (Ballentine and Holm, 1984).
- A minimum tree diameter at breast height (d.b.h.) of 28 cm is typically required for the formation of suitable cavities for nesting waterfowl (Lowrey and Holm, 1989).
- Denton et al. (2012) found that 69%, 17%, 12%, and 2% of cavity entrances formed as the result of natural limbs and subsequent decay, woodpeckers, broken and rolled trunks, and other processes, respectively.

Target Species

Air sparrow (Wood Duck): lay 6-16 eggs and have 1-2 broods. They typically eat seeds, nuts, fat, fruit, and arthropods. Breeding habitat is often wooded wetlands, ponds, and tributaries of eastern North America.

Lophodytes cucullatus (Hooded Merganser): diving ducks that commonly eat small fish, insects, invertebrates, amphipods, and vegetation. Their clutch size ranges from 5-15 eggs and typically have 1 brood. Commonly breed in the eastern United States, but migrates to show winter.

Bucephala clangula (Common Goldeneye): diving duck that feeds on aquatic invertebrates, fat, fish eggs, seeds, and vegetation. They lay 4-10 eggs and 1 brood. Frequently nests near ponds and lakes of forested wetlands and migrates to show winter.

Falco sparverius (American Kestrel): North America’s smallest falcon that feeds primarily on small mammals, birds, and insects. They lay 3-6 eggs and have 2 broods. American Kestrels prefer open areas and anthropogenically modified habitats. Most American Kestrels require at least 1-2 years of tree nesting experience, but occasionally stay in the southern United States during the winter months.

Artificial Nest Box Methods

- 16 waterfowl artificial nest boxes and 3 American Kestrel boxes were monitored for metrics including egg abundance, occupant species, evidence of predation, and cavity entrance location.

Artificial Nest Box Results

Table 1. Artificial nest box results of nests and hatching success of LARMAA.

<table>
<thead>
<tr>
<th>Species</th>
<th>Waterfowl Nest Boxes</th>
<th>American Kestrel Boxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chick Abundance</td>
<td>82</td>
<td>15</td>
</tr>
<tr>
<td>Hatching Success</td>
<td>68%</td>
<td>84%</td>
</tr>
<tr>
<td>Tree Cavity Preference</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td>Nest Box Availability</td>
<td>60%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Artificial Nest Box Locations

- Lake Alice Wildlife Management Area (LARMAA) is located in the town of Chazy, Clinton County, NY. LARMAA is managed by the NY DEC and encompasses 594 ha of varied habitat including mesophytic hardwoods, deciduous-shrub mesic, upland wetland, and various forest types.

Natural Tree Cavity Survey Methods

- Tree cavities were monitored for 16 waterfowl nest boxes and 3 American Kestrel boxes at Lake Alice Wildlife Management Area (LARMAA). Metrics included were egg abundance, occupant species, evidence of predation, and cavity entrance location.

Natural Tree Cavity Survey Results

- 82 waterfowl artificial nest boxes and 3 American Kestrel boxes were monitored for Metrics including egg abundance, occupant species, evidence of predation, and cavity entrance location.

Forest Community Survey Methods

- We randomly selected and surveyed 2 X 0.04 ha circular plots (11.3 m radius) within hardwood forests adjacent to the artificial nest boxes, in order to gather preliminary baseline forest community data (structure, density, and occupancy of forested species in the cavity tree preference.

Forest Community Survey Results

- Trees were identified and turned into dbh classes to assess the potential for the forest to support natural cavity nesting species suitable for target species. Trees ≥ 2.54 cm dbh were not identified.

Discussion

- Off the 16 waterfowl nest boxes, only 25% (n = 4) contained nests occupied by Wood Duck in 2017, of which one was an unsuccessful nesting attempt.
- Of the 38 waterfowl eggs, 61% (n = 23) hatched successfully.
- The three American Kestrel boxes failed to attract target species, but were occupied by Tyto alba (butterfly). (Swallow Tanager).
- Twenty-nine natural tree cavities and 2 abandoned parasite nests (St-facing) were observed in 19 different trees ranging in d.b.h. from 22-27 cm.
- Cavity trees comprised of 42% (n = 8); Aorub rubrum (Red Maple), 17% (n = 2); Aor acer (Sugar Maple), 12% (n = 1). Fraxinus americana (White Ash), and 2% (n = 1) Sapindus quinqueramus were snags.
- 62% (n = 18) and 38% (n = 11) of cavities were excavated by woodpeckers and resulted from natural limbs and canopy damage, respectively.

Even though more natural cavities were found in red maples, this is most likely due to their prevalence on the landscape. IFA analysis removes relative abundance bias and reveals a preference for cavities with smooth walls and maps.
- Observed occupancy ratios range from 13-38% (mean = 21%) at LARMAA.
- We encourage NYS DEC relocate some (5) nest boxes.
- Since nest boxes are not limited, and nest parasitism is infrequent at LAWMA, we suggest next nest boxes to be relocated closer to standing water and away from forests with an abundance of small dbh tree classes. Female ducks often avoid forest stands lacking large trees which contain suitable cavities (Watt et al. 1996).
- Densities of natural cavities suitable for ducks are projected to increase as regenerating forests mature and trees grow into larger size classes (Denton et al. 2012).

Management Implications & Future Directions

- In the northeast, sugar and red maples are important target species for forest management to support waterfowl nesting.
- Maple sugaring operations are vital to the economies of northern New York and the northeastern United States. Specifically, expansive stands of mature sugar maples are found neighboring LAWMA in the town of Chauny, NY.
- Cavity surveys should be performed to assess if dual ecosystem services are being supported in these stands.
- These forests should be managed (leaving standing dead snags) to promote primary cavity nesting species Dryocopus martius (Red-tailed Hawk; Pileated Woodpecker) in order to create nesting sites suitable for secondary cavity nesters.
- Continued monitoring of artificial nest boxes must occur as forests succeed to determine whether they become occupied.
- Our forest survey sites were located on the northern lake extent, coincident with artificial boxes. Many hardwood forests to the east of LAWMA could be surveyed for natural tree cavities.

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References


