

Project title: Wood duck nesting ecology and recruitment in Louisiana

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Introduction

In North America, the Wood Duck (*Aix sponsa*) is the most abundant species of breeding waterfowl south of 40° N latitude, and most are found along the Mississippi River and riparian areas further east¹. Relative to other waterfowl, their historical year-round abundance near populated areas led to especially acute levels of overharvest—bordering on extirpation—until the passage of the Migratory Bird Treaty Act in 1918. By the mid-1940s, populations had recovered to sufficient levels to permit harvest in most states, making Wood Ducks one of the greatest conservation success stories in waterfowl management². Today, populations are stable or increasing³, and Wood Ducks are the most abundant bird in the bag in several southeastern states, including Alabama, Georgia, and the Carolinas⁴. Moreover, they provide consistent hunting opportunity in states like Louisiana, where migration of other dabbling ducks is becoming increasingly unpredictable.

The success of Wood Ducks is attributed in part to the large-scale establishment of nest box programs, which can help mitigate the loss of natural cavities in degraded riparian areas. Nevertheless, due to the sheer scale of available cavities in many regions⁵, the majority of Wood Duck recruits at a continental level are derived from natural cavities³ (with local exceptions in California and Nevada²). Nest box programs should be evaluated for their effectiveness, especially in geographies where cavities are not limiting⁶ or where rates of parasitism are high⁷ to achieve maximum efficiency and output. Periodical assessment of wood duck nest boxes in terms of use, nest success, and recruitment allows for adaptive management of these programs.

Eastern Wood Ducks have been extensively studied over the past 30 years, with research focusing on duckling production^{1,3,8}, duckling movements and survival^{9,10}, and recruitment and site fidelity¹¹⁻¹³. Demographic estimates vary by geography, habitat type, and box placement, highlighting the need for local studies to evaluate the efficacy of nest box programs for Wood Ducks³. Moreover, the recent and continuing expansion of Black-bellied Whistling-Ducks (*Dendrocygna autumnalis*) into the range of Wood Ducks² also raises questions of nest-site overlap, competition, and interspecific brood parasitism that historical studies may not have adequately captured^{14,15}. Effective adaptive management of nest box programs requires up-to-date information on box occupancy, production, and recruitment, and this is especially pressing when regional nest box programs do not enforce strong maintenance and monitoring programs¹⁶.

In recognition of this research need, Nemours Wildlife Foundation and the James C. Kennedy Waterfowl & Wetlands Conservation have proposed a collaborative Wood Duck research project spanning multiple states in the southeastern U.S. This proposal was in direct response to widespread belief among agency personnel that additional demographic information is needed to improve population evaluation and management for Wood Ducks and nest boxes. In addition to pooling data across geographies to broadly describe Wood Duck ecology, there are clear opportunities to draw important distinctions among regions, and tackle questions of more local importance.

Objectives

- 1) Estimate annual nest box use, rates of conspecific parasitism, and duckling production from established Wood Duck boxes at three representative sites in Louisiana.
- 2) Determine habitat characteristics associated with levels of box use, conspecific parasitism, and duckling production.

- 3) Estimate recruitment of marked ducklings into the nest box breeding population, and landscape-level habitat characteristics that may influence recruitment.
- 4) Monitor nest box use by Black-bellied Whistling-Ducks to evaluate temporal overlap, habitat overlap, and potential competition/parasitism with Wood Ducks.
- 5) Analyze existing female box-banded recovery and recapture data to inform local estimates of Wood Duck demographics.
- 6) Collaborate and share data with partners across the region to inform best adaptive management practices for Wood Duck nest box design, placement, and maintenance.

Methods

This project will target three sites and nearby properties supporting >100 nest boxes each: Sherburne Wildlife Management Area, Dewey Wills Wildlife Management Area, and Russell Sage Wildlife Management Area. Boxes will be monitored approximately once per week from 15 January to 15 August, with more frequent checks as occupied boxes approach hatching. When a box is discovered occupied, each egg will be candled to determine incubation stage¹⁷ and individually numbered on the side and the rounded (air space) end with a Sharpie to determine egg success. As time permits, each egg will be measured and weighed to attempt post-hoc categorization of parasitism. Nests will be considered parasitized if the total number of eggs exceeds 15, or if more than 1 egg per day appears in the box.

Within two weeks of the onset of incubation, the female will be captured on the box and banded with a size 5A aluminum USGS leg band. Detailed morphometric measurements will be collected, including true tarsus length, wing chord, culmen width and length, white eye patch length and width, and mass. Blood samples may also be drawn using a tarsus prick, blotted onto dry matrix for later relatedness analysis. As the hatch date approaches, nests will be checked at 1-3 day intervals. Ducklings will be captured on the nest, sexed by cloacal examination¹⁸, weighed, and measured for tarsus length. All ducklings will be microchipped with a 2x12 mm Cyntag Passive Integrated Transponder (PIT tag) inserted subcutaneously between the scapula. Half of all ducklings will be double-marked with matching serial Monel web tags to evaluate potential survival bias in web-tagged ducklings. In years 2-3 of the study, all females captured on the nest will be checked for PIT tags before banding.

At each box, we will measure the vegetation type and cover surrounding the box, distance of the box to water, nest box height, distance to nearest neighbor, and volumetric/construction metrics of the box itself (to the extent that they are variable). We anticipate using cover boards to measure visual obstruction, and range-finders and GIS to quantify distances between boxes and water. Cover measurements will be made on the day at which a box is discovered occupied to prevent phenological bias in linking vegetation growth to demographic outcomes¹⁹. In hydrologically dynamic habitats, distance to water will be measured when the nest is discovered active (to evaluate habitat selection) and on the day the clutch hatches (which could influence brood survival).

Anticipated Outcomes

- 1) Information on box use, parasitism, duckling production, recruitment, and the mechanisms that may drive those, which can help guide decisions on how best to manage nest box programs going forward.
- 2) Establishment of regional collaborative partnerships whose unified scientific approach can help managers broadly generalize about the efficacy of Wood Duck nest box programs and their contribution to management and outreach goals.
- 3) Leveraging historical banding data to derive modern estimates of local Wood Duck demographics.
- 4) New information on the nesting ecology of Black-bellied Whistling-Ducks, which may open avenues of applied scientific inquiry relevant to the management of cavity-nesting species in Louisiana.

Louisiana Department of Wildlife and Fisheries Budget

Description	19-20	20-21	21-22	22-23	Total
Graduate student stipend	\$ 21,000	\$ 21,000	\$ 21,000	\$ 21,000	\$ 84,000
Graduate student tuition @35%	\$ 7,350	\$ 7,350	\$ 7,350	\$ 7,350	\$ 29,400
Graduate student fees	\$ 4,000	\$ 4,000	\$ 4,000	\$ 4,000	\$ 16,000
Technicians (1 at \$1550/mo for 6 mo)	\$ 9,300	\$ 9,300	\$ 9,300		\$ 27,900
Technician fringe @7.65%	\$ 711	\$ 711	\$ 711		\$ 2,134
Travel	\$ 3,000	\$ 3,500	\$ 3,500	\$ 1,500	\$ 11,500
Supplies	\$ 4,000	\$ 3,000	\$ 3,000		\$ 10,000
Publication fees		\$ 800	\$ 800	\$ 800	\$ 2,400
Subtotal	\$ 49,361	\$ 49,661	\$ 49,661	\$ 34,650	\$ 183,333
LSU indirect (less tuition) @20%	\$ 8,402	\$ 8,462	\$ 8,462	\$ 5,460	\$ 30,786
TOTAL	\$ 57,763	\$ 58,123	\$ 58,123	\$ 40,110	\$ 214,119

Nemours Wildlife Foundation Budget

Description	19-20	20-21	21-22	22-23	Total
Technicians (1 at \$1550/mo for 6 mo)	\$ 9,300	\$ 9,300	\$ 9,300	\$ -	\$ 27,900
Technician fringe @7.65%	\$ 711	\$ 711	\$ 711	\$ -	\$ 2,133
TOTAL	\$ 10,011	\$ 10,011	\$ 10,011	\$ -	\$ 30,033

Budget Description

- Graduate student stipend now split from graduate student fees, which saves \$1,400/year in tuition remission
- Technicians hired for 6 months only; the graduate student is solely responsible for nest checks for the first and last month of the field season
- Travel includes both conference travel in years 3-4, and in-state travel for field work, and assumes trucks are provided by LSU and LDWF
- The major supply expense is for PIT tags:

- 130 boxes/site x 3 sites = 390 boxes x 40% occupancy = 156 nests x 65% nest success = 102 hatched nests x 11 eggs = 1116 eggs x 63% egg success = 703 ducklings. ~1000 PIT tags/year @\$1.80 each = \$1,800
- Recent publication fees ~\$800 per manuscript

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