COMPARATIVE USE OF THREE TYPES OF WOOD DUCK NEST BOXES[1]

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ABSTRACT

In 1971 a joint Tennessee Valley Authority-Tennessee Wildlife Resources Agency effort began to increase wood duck *(Aix sponsa)* productivity, test nest structure acceptability, and document competition-predator problems on a 12.5-mile segment of the upper Holston River in Hawkins County, Tennessee. Over 90 standard wooden, rocket, and horizontal wood duck nest boxes were installed. Duck use of nest boxes increased from 6 percent in 1971 to 44 percent by 1975. Woodie preferences progressed during this time as follows: wooden boxes, 12 percent to 55 percent use; rocket boxes, 3 percent to 57 percent use; and horizontal structures, 0 to 23 percent. Starlings *(Sturnus vulgaris)* were chief competitors, using 40 percent available rocket boxes, 19 percent wooden boxes, and 6 percent horizontal structures in 1975. Nevertheless, the use of artificial nesting structures to bolster local wood duck populations appears to be worthwhile in east Tennessee if proper type, erection, and maintenance can be assured.

INTRODUCTION

The status of wood duck *(Aix sponsa)* populations has been the subject of investigation in several states during recent years (Beshears, 1974).

Major studies were conducted in New Hampshire (Lee, 1953), Vermont (Miller, 1952), Illinois (Bellrose, 1953), and Massachusetts (McLaughlin and Grice, 1952). Once threatened with extirpation over much of its range, the woodie has made a remarkable recovery. Nevertheless, considerable habitat degradation and/or destruction has occurred throughout its range, particularly in the Southeast (D. H. Hankla and V. E. Carter, 1965).

In 1971 a program of wood duck nesting box erection and maintenance was started on John Sevier Lake[2] — Holston River in east Tennessee. The purpose of this joint TVA-TWRA effort has been to increase wood duck productivity along this stream, test wood duck acceptability of the three standard artificial nesting structures in use currently in eastern United States, and document competitor-predator problems for eastern Tennessee habitats. This paper summarizes results through the spring 1975 breeding season.

MATERIALS AND METHODS

The Study Area

The study area comprised a 12.5-mile segment of the Holston River in Hawkins County, Tennessee, extending from Surgoinsville Bridge to TVA's John Sevier Steam Plant near Rogersville. The area is divided into two parts: the John Sevier Lake Section (Figure 1) and the Holston River Section (Figure 2). The lake section begins at John Sevier Dam[2] and ends at the northeast apex of Burem Island. The river section begins at this apex of Burem Island and extends to Surgoinsville Bridge.

The wood duck nesting project was begun because it appeared to biologists censusing the Holston River that natural cavities were limiting in relation to the number of breeding pairs noted. Minser (1968) reported nest sites close to the Holston River were scarce and that trees large enough to provide good cavities were uncommon along river banks. He concluded that due to this phenomenon, wood ducks were having to nest on wooded ridges and coves at least one-quarter mile away from the lake and river sections.

Therefore, up to 92 nest structures have been installed and maintained beginning in January 1971 to ensure that every suitable portion of the study area would have some nest sites over water or upon adjacent river banks.

[1] This is a government publication and not subject to copyright.

[2] For the purposes of this paper, John Sevier Lake and John Sevier Dam refer to TVA's John Sevier water supply dam and/or reservoir.

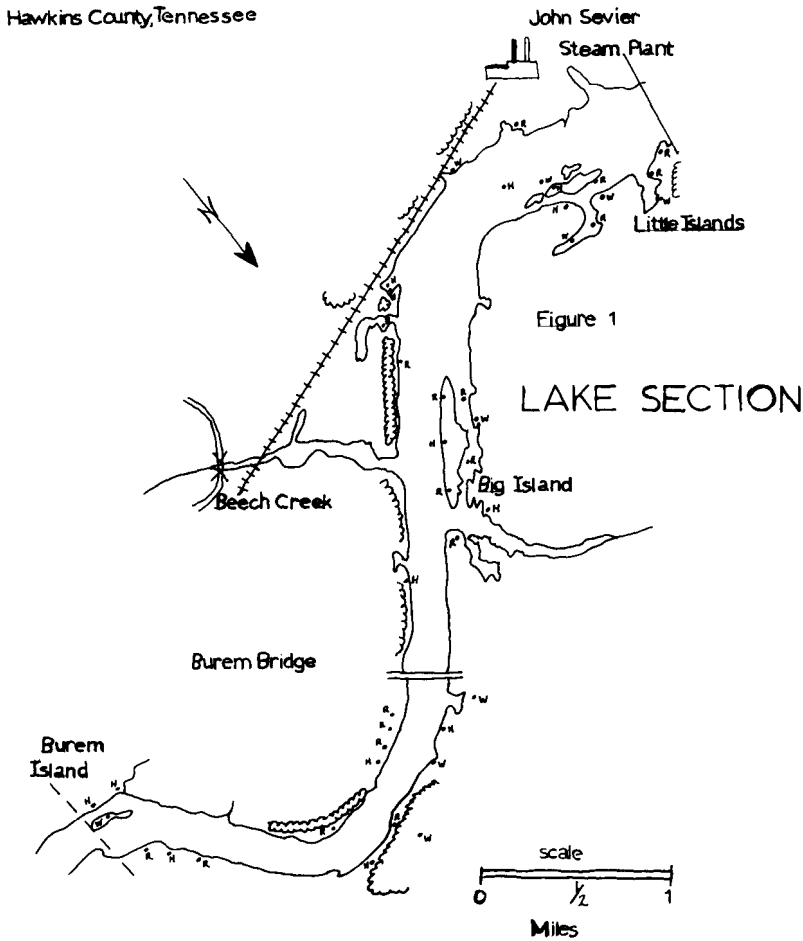

Figure 1

LAKE SECTION

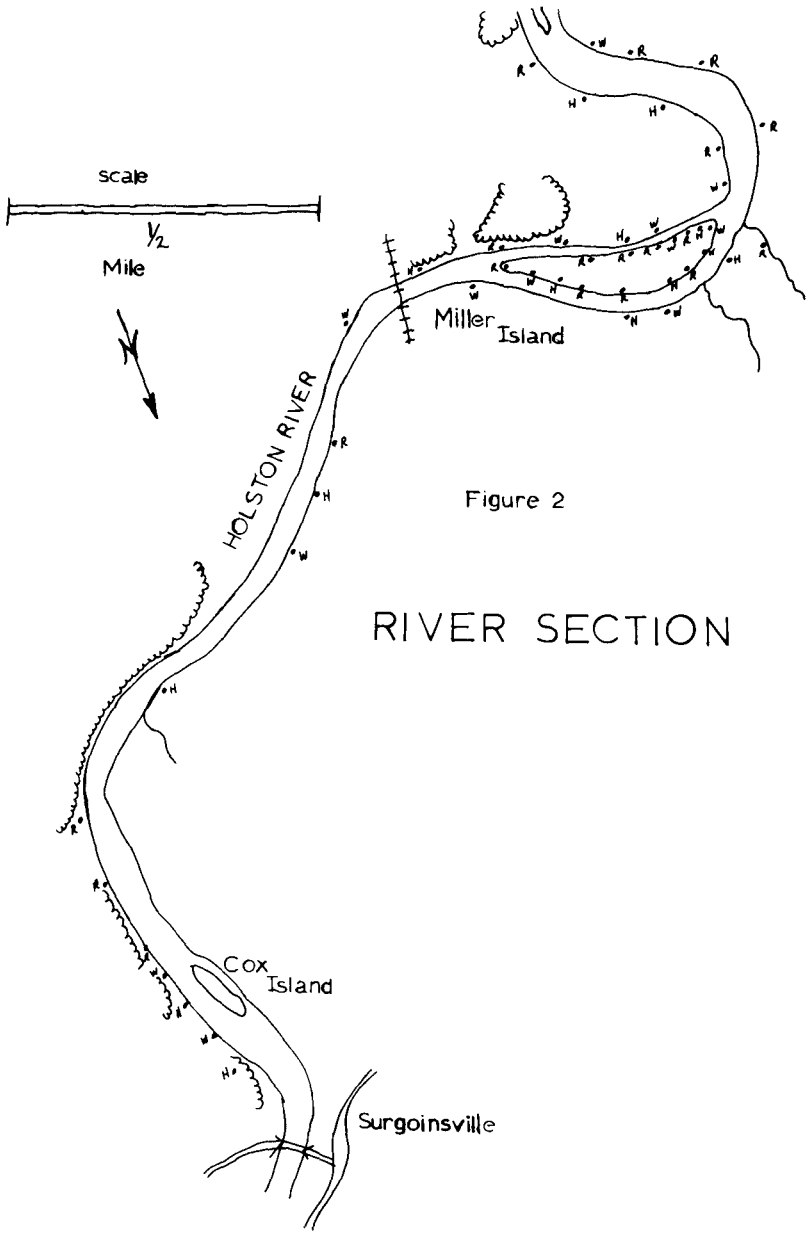

Figure 2

RIVER SECTION

Types of Boxes

The wood duck boxes erected on the Holston River consist of three types: wooden, metal rocket, and metal horizontal. All represent the typical, standard artificial nesting structures used for wood ducks in eastern North America (Webster, 1954; Bellrose, 1953; McGilvrey and Uhler, 1971).

Placement of Boxes

The wood duck is usually considered an inhabitant of wooded areas and small streams rather than marshes which are utilized more by other dabbling ducks. This could be due to their preference of tree cavities for nesting, rather than a preference for this habitat. For instance, where nesting boxes have been provided, great nesting densities have been built up on the marshes (McLaughlin and Grice, 1952). As noted by these authors, nest boxes can do the most good in situations (such as the Holston) where the number of wood ducks apparently exceeds the number of available cavities. Accordingly, nest boxes were located throughout the study area in open situations (field borders, open water, marshes), as well as in forested settings (Figures 1 and 2).

In 1975 the lake portion had 13 nest boxes on metal posts over water and 31 boxes placed on trees along the shoreline and islands. The river portion had a total of 44 boxes which were erected along the shoreline and islands of the river.

The artificial nesting structures erected over water were placed on metal poles with boxes attached at least 1½-feet above the highest recorded flood levels. During normal pool, boxes were usually 5-6 feet above the water. These were erected only on the lake portion, because water level fluctuations upstream prevented placing boxes low enough to be checked, yet high enough to escape flooding or damage from debris moving in swift water.

Nesting Material

Each year prior to spring nesting, all boxes were examined, repaired or replaced as needed, and cleaned out. Since wood ducks carry no nest building material, at least four inches of sawdust and shavings were put in each box.

Nest Box Inspections

Boxes were numbered and data noted as to the use by wood ducks or other species. Prior to 1975, boxes were inspected only as time and manpower permitted, and complete data were not collected. Therefore, data on number of eggs and eggs hatched are included only for the 1975 season. In 1975 data were collected on May 8 and May 30 noting use, number of eggs, eggs hatched, and evidence of predation or competition (Table 1). This work was done through a cooperative student intern program established by TVA at The University of Tennessee, Knoxville.

RESULTS AND DISCUSSION

Nest Box Usage

Seventy-seven boxes were available for use in 1971. This number was increased to 88 in 1972, reduced to 81 in 1973, increased again to 92 in 1974, and dropped to 88 structures in 1975. Losses occurred each year due to human molestation, or in two years, to mounting poles being uprooted by the action of debris and swift current during flood stages.

Wood ducks began arriving on the Holston River in late February and early March. Although a few clutches were started in March, the major egg-laying periods were in April and May.

A definite increase in the usage of nest boxes by wood ducks was found during the five-year study from an initial use of only 6 percent to 44 percent four years later (Table 2). The number of nesting structures used each year by wildlife competitors ranged from 1 (sparrow hawk, 1971-1973) to 33 (starling, 1972). These data are included in Table 2.

Wood duck preferences for each type of structure progressed from 1971 to 1975 as follows (Table 3): 12 percent to 55 percent of wooden boxes; 3 percent to 57 percent of rocket boxes; and 0 to 23 percent of horizontal boxes. Starling use during this same interval progressed as follows: wooden boxes, from 55 to 75 percent, declining to 19 percent; rocket boxes, from 0 to 40 percent; and horizontal structures from 0 to 6 percent.

Abandonment of nests was caused by starling competition. Ten starling nests were built on top of wood duck nests in 1975. Causes of other abandoned nests were more difficult to document. Human molestation could have caused some abandonment by wood ducks, but the total extent was unknown. Apparently most cases of molestation were due to curiosity. The box was opened and examined and either the top wasn't replaced or the duck was disturbed and abandoned her nest. In a few cases, molestation was deliberate: eggs were taken or the box was shot full of holes. Such deliberate molestation occurred on two boxes in 1975.

Table 1. Wood duck nesting success in artificial nesting structures, 1975 season Holston River study area, Tennessee.

Lake Section					*River Section*				
Box No.*	*Eggs Laid*	*Eggs Hatched*	*Percent Hatched*	*Causes for Losses*	*Box* No.*	*Eggs Laid*	*Eggs Hatched*	*Percent Hatched*	*Causes for Losses*
2R	12	0	0	Starling nest	2W	14	13	93	
3H	19	0	0	**	4R	9	0	0	Abandoned
4H	11	8	73	Undeveloped embryos	7R	12	6	50	Undeveloped embryos
7R	2	0	0	Starling nest	10H	13	13	100	
8R	12	0	0	Starling nest	11R	12	11	92	Undeveloped embryos
9R	10	0	0	Starling nest					
10W	5	0	0	Starling nest	15R	15	15	100	
11W	18	0	0	**	17W	12	9	75	Undeveloped embryos
12H	11	0	0	**					
13W	18	0	0	Starling nest	20R	9	0	0	Abandoned
14R	7	0	0	Starling nest	21W	7	7	100	
15R	12	12	100		28R	12	12	100	
16W	3	1	0	Starling nest	30R	15	15	100	
17H	7	0	0	Abandoned	39R	13	6	46	Undeveloped embryos
20R	1	0	0	Starling Nest					
24R	6	0	0	**	40H	13	13	100	
25R	14	0	0	Starling nest	41R	10	10	100	
26W	10	0	0	Torn down	42H	12	5	42	Undeveloped embryos
27R	9	9	100						
32W	11	11	100		43W	14	7	50	Undeveloped embryos
33R	10	10	100		Lake	246	87	35	
34W	22	20	91	Undeveloped embryos	River	192	142	74	
46W	16	16	100		Total	438	229	52	

*W = Wooden; R = Rocket; H = Horizontal type nesting structures

**Hen killed due to improper placement of radio transmitter during a separate TVA study beginning in 1975 to track local brood movements by keying on female with brood.

Table 2. Wood duck nesting records for boxes erected on the Holston River, Hawkins County, Tennessee.

	Wood Duck Use			
	Nesting Boxes			
Year	**No. Available*	*No. Used Ducks*	*Percent Used*	*No. Not Used*
1971	77	5	6%	54
1972	88	14	14%	39
1973	81	19	23%	32
1974	92	36	39%	24
1975	88	39	44%	32

	Competitor Use			
	Number of Nest Structures Used			
Year	*Sparrow Hawk*	*Screech Owl*	*Gray Squirrel*	*Starling*
1971	1	3	——	16
1972	1	13	1	33
1973	1	9	3	11
1974	3	6	9	27
1975	0	7	1	20

* Some boxes were used by different hens and competitors in the same nesting season.

Table 3. Wood Duck-Starling preferences by nest box type.

Year	*1971*	*1972*	*1973*	*1974*	*1975*
Number of Boxes Available					
Rocket	26	36	30	37	35
Wooden	25	28	29	25	22
Horizontal	26	24	22	30	31
	77	88	81	92	88
*Wood Duck Use	*Percent of Each Type Available*				
Rocket	03	16	30	48	57
Wooden	12	25	27	52	55
Horizontal	00	04	09	16	23
Starling Use					
Rocket	00	33	23	45	40
Wooden	57	75	13	32	19
Horizontal	00	00	00	06	06

* Some boxes were used by different hens and competitors in the same nesting season. Therefore, use of available boxes is over 100 percent.

Clutch Size

A total of 39 wood duck nests were inspected during the 1975 season. They contained 438 eggs for an average of 11.2 eggs per clutch, fitting the normal range in clutch size (10 to 15 eggs) as reported by Kortwright (1943). In previous years production was estimated based on the number and size of broods seen during periodic censuses conducted on the same portion of the Holston River. A report covering this aspect of study on the Holston is being prepared.

Dump Nesting

"Dump nesting" is a common occurrence as noted by several biologists: Leopold (1951), Beshears (1974), and Grice and Rogers (1965) to cite only a few. This activity is the laying of eggs by two or more females within the same nest. Beshears (1974) reported that clutches of 20 or more eggs should be considered dump nests. Only one nest was observed during the study with a clutch size over 20 (22 eggs). Two other nests were observed with 18 eggs and 1 nest with 19 eggs during the 1975 season, however. These, too, were probably dump nests even though they didn't meet the Beshears' 20 plus qualifier.

Nest Competition

Starlings appeared to be the only significant competitor on the Holston River. Starlings can constitute a major threat where there is an interspersion of woods and farmlands (Bellrose and McGilvrey, 1966). This was the case on the Holston River. Agricultural lands and wooded patches formed such an interspersed cover condition along the river (Figures 1 and 2).

Starling use of wood duck houses has been reduced by the discovery that starlings are more intolerant of light and/or large openings than are wood ducks (McGilvrey and Uhler, 1971). At John Sevier, this was tested by erecting 30 horizontal nest structures by 1974. Starling use of these houses has been negligible. But so far wood duck acceptance and use has been lower than that found for the other types of nest boxes (Table 3).

Starlings did not become a menace to nesting wood ducks in the United States until the last decade (*ibid.*). The loss of eggs in wood duck nests to starlings was not serious in Illinois until 1962, when 18.5 percent of the nests were destroyed. Corresponding percentages for 1963 and 1964 were 23.8 and 20.6, respectively (*ibid.*). The loss of eggs to starlings at the Holston River study area could not be ascertained; however, starlings usurped large numbers of houses, many of which could have been used otherwise by wood ducks (Tables 2 and 3).

The poorer success of wood duck nesting on the lake section (Table 1) was partly because of starling competition. All 10 instances were documented there where wood duck nests were covered over by starling nesting material. None were noted in the more wooded, less open habitat along the river section. This agrees with the conclusions reached by McGilvrey and Uhler (1971) that starlings seem to prefer boxes in open impoundments to those in wooded impoundments.

Screech owls (*Otus asio*), sparrow hawks (*Falco sparverius*), rat snakes (*Elaphe obsoleta*), and gray squirrels (*Sciurus carolinensis*) also used boxes in 1975 (Table 2). None were believed responsible for causing significant losses of eggs or ducks; nor were they deemed serious competitors for nest sites.

Management Considerations

While wood duck utilization after five years is not as high as was hoped, the average 8 percent increase in use per year is encouraging. Part of the depressed use could be due to poor placement of boxes, as inferred by Bellrose, Johnson, and Meyers (1964). Converting more (if not all) of the structures on the lake section and other open sites to horizontal types should reduce interspecific strife now occurring between starlings and wood ducks.

Competition and/or predation by other wildlife species is not serious at this time. There were no raccoon (*Procyon lotor*) or their sign observed on the study area. Until this species makes its presence felt, it does not seem necessary to install the predator guards typically needed in wood duck breeding habitat.

Based upon results to date, the use of artificial nesting structures to bolster local populations of wood ducks appears to be a worthwhile endeavor in east Tennessee if proper erection and maintenance can be assured.

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WATERFOWL HABITAT IN LAKES OF THE ATCHAFALAYA BASIN, LOUISIANA

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ABSTRACT

Rooted vegetation in lakes of the Atchafalaya River Basin was adversely affected by increasing water turbidities from rising flood waters. Duck food plants decreased 80 percent from October 1972 to October 1973 as a result of severe flooding. Different sections of the basin were affected more than others by high water levels. Pest plants were a problem throughout most of the basin but presented no great problem in the study areas. Lakes in the lower section of the swamp region and the marsh region had the highest occurrence of vegetation during the study period. The middle and lower sections of the swamp region and the marsh region had higher duck usage than the upper section. Water turbidities were lowest in the upper section of the swamp region and water depths greatest.

INTRODUCTION

Louisiana is one of the outstanding waterfowl wintering areas in North America and peak wintering populations are approximately five million ducks and one million coots (Bateman and Summerall 1971). Waterfowl habitat in Louisiana takes in some 7,403,478 acres or about 23.8 percent of the total area of the state (St. Amant 1959). This large expanse of wetlands may be broken down into various habitat types. These are the coastal marshes, cypress-tupelo swamps, lakes and rivers and agricultural lands.

The coastal marshes of Louisiana are well recognized as the major waterfowl wintering area; however, this type of habitat is only attractive to a certain segment of the waterfowl population. The other habitat types are used by other segments, with each species selecting conditions suitable to its needs.

The maintenance of habitat diversity is an important phase of maintaining habitat quality; and, if waterfowl are to remain a viable part of our local fauna, a well-balanced habitat of all types must be preserved.

The largest swamp and bottom land area in Louisiana is the 1,300-square mile floodplain bordering the Atchafalaya River often referred to as the Atchafalaya Basin. The Atchafalaya Basin comprises the second largest swamp in the United States and has been described as "an irreplaceable wilderness area" (Bruce 1972), "one of the greatest natural lands in the world" (Wharton 1970) and "the greatest of all swamps" (Glasgow 1972). Increased siltation and channelization for flood control are causing the topography of the basin to change very rapidly and will likely affect the quality and quantity of waterfowl habitat in the area. Houck (1972) described flood control as "drying up the Atchafalaya Basin"; however, an accurate assessment of the impact of the changing environment on waterfowl cannot be made without information on the waterfowl resources of the area.

This study was an evaluation of lakes in the Atchafalaya River Basin as waterfowl habitat and their utilization by ducks and coots.

DESCRIPTION OF STUDY AREA

The study area included the Atchafalaya River floodplain south of Interstate Highway 10. It was divided into two major regions: the swamp region and the marsh region (Fig. 1), which were collectively identified as the Atchafalaya Basin. Floodway protection levees formed the east and west boundaries of the study area. The swamp region was sub-divided into three sections: upper section, middle section, and lower section and was separated from the marsh region by U. S. Highway 90.

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