

# Longevity of Artificial Den Structures for Raccoons in Kentucky

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*Abstract:* Thirty-nine artificial den structures for raccoons (*Procyon lotor*) were examined to determine structure condition and occupancy on 3 areas in central Kentucky. Thirty-four of the structures were 6 years old and 11 (32%) of these were considered habitable by raccoons. Five of the structures were 3 years old and all were considered habitable by raccoons. All 16 of the habitable structures exhibited some type of animal activity. Data suggest that weathered artificial den structures are used extensively by a variety of wildlife. Methods of increasing den structure longevity are discussed.

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Increases in the number of raccoon recreationists in many areas of the southeastern United States have placed high demands on localized raccoon populations. Furthermore, increased silvicultural practices are decreasing denning sites for cavity dependent wildlife (McComb and Noble 1981, Krantz 1985). Butterfield (1954) and Dorney (1954) suggested that tree dens were not needed for maintenance of high raccoon populations, but several researchers believe that tree cavities are preferred by raccoons as denning sites (Stuewer 1943, Whitney and Underwood 1952, Kaufman 1982, Schneider 1982). Gysel (1961) noted that raccoons were most numerous in timber stands having the most tree cavities.

In an attempt to maintain or increase raccoon populations, several researchers have suggested the provision of artificial den structures (Stuewer 1948, Krantz 1985). McComb and Noble (1981) suggested that when artificial den structures are interspersed with natural cavities, interspecific competition for natural cavities may be reduced, thus propagating the productivity of cavity-denning species. Successful use of artificial den structures to manage for raccoons partially depends upon the longevity of the structures. Typically, artificial den structures receive minimal use

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of the first few years following erection, and use increases as the structures age (Stuewer 1948, Butterfield 1954, Krantz 1985). This study was undertaken to evaluate the condition and occupancy of aged artificial den structures originally erected for raccoons in central Kentucky.

## Methods

Evaluation of artificial den structures occurred on 3 areas in the foothills of the Kentucky Knobs (Fenneman 1938); 1) the Clay Wildlife Management Area (CWMA) in Nicholas County, 2) the Central Kentucky Wildlife Management Area (CKWMA), and 3) the Lexington-Bluegrass Army Depot (LBAD), both in Madison County. The CWMA and CKWMA consisted of interspersed upland and bottomland hardwoods, croplands, and old fields. The LBAD was composed of interspersed old pasture, upland and bottomland hardwoods, and cedar thickets. The CWMA and LBAD have low densities of naturally occurring tree cavities suitable for raccoons (1 per 3 ha and 1 per 20.2 ha, respectively; Krantz 1985). No quantitative information was available on the occurrence of natural cavities on the CKWMA. More detailed descriptions of the study areas are presented in Krantz (1985; CWMA and LBAD) and Roloff (1990; CKWMA).

In 1984, 20 artificial den structures were erected on the CWMA and 20 on the LBAD (Krantz 1985). In 1987, 6 artificial den structures were erected on the CKWMA (J. Norment, pers. comm.), totaling 46 structures for evaluation. The structures were constructed from yellow poplar (*Liriodendron tulipifera*) according to plans developed by Stuewer (1948). The dimensions of the cavity of the structures were  $30.5 \times 30.5 \times 91.4$  cm with a  $14.0 \times 15.2$ -cm opening (Krantz 1985). The openings of the structures were an average of 10.8 m ( $\pm 1.47$  m) above the ground, and den structures were placed an average of 34.3 m ( $\pm 45.1$  m) from a water source (Krantz 1985). Construction details of the erected structures are presented in Krantz (1985).

The 46 artificial den structures were evaluated during April of 1990 to determine structure condition and occupancy. Den structures were evaluated with the aid of climbing spurs. The condition of the den structures was deemed "habitable" and "uninhabitable" based on the ability of the structure to provide support and shelter for an adult raccoon.

## Results

The 40 den structures on the CWMA and LBAD were approximately 6 years old at the time of evaluation. Thirty-four (85%) were located, 11 (28%) of which were in habitable condition for raccoons. Downed structures that were washed away by high water levels probably accounted for the 6 structures that were not located. Additionally, inaccuracies in the maps of artificial den locations may have caused some structures to be overlooked.

Seventeen of the 20 den structures erected on the CWMA were located and 7

were habitable by raccoons (Table 1). All 10 of the uninhabitable structures had no bottoms and/or tops.

On the LBAD, 17 structures were located and evaluated (Table 1). Four of the structures were habitable, and of the 13 that were uninhabitable, 10 had no tops and/or bottoms and 3 had fallen from the trees.

The den structures on the CKWMA were approximately 3 years old at the time of evaluation. Five (84%) of the 6 structures were located, and all 5 (100%) structures were in habitable condition for raccoons (Table 1).

All of the 16 habitable den structures exhibited some type of animal activity. Animal sign was noted in 5 structures and included corn debris, nesting material, cardinal (*Cardinalis cardinalis*) feathers, hickory-nut (*Carya* spp.) husks, and scat. Eleven of the structures were occupied at the time of evaluation. Occupants included raccoons ( $N = 5$  boxes), fox squirrels ( $N = 5$ ; *Sciurus niger*), and insects ( $N = 1$ ; Order Hymenoptera). The 6-year-old structures accounted for 4 of 5 documented raccoon occupancies (Table 1). The use of the den structures for rearing of young was documented for raccoons ( $N = 1$ ) and fox squirrels ( $N = 1$ ).

**Discussion**

The results of this study indicated that weathered artificial den structures for raccoons were used extensively by a variety of animal species. Due to the relatively low costs (\$5.85 for materials; Krantz 1985) associated with artificial den structure construction and erection, artificial den structures appear to be a good wildlife management alternative for increasing cavity densities.

Weathering of the den structure may be important in getting raccoons to use these structures, and use is expected to increase as the structure ages (Krantz 1985). In this study, only 32% of the 6-year-old den structures were habitable. Additionally, 6-year-old habitable structures were often in an advanced state of deterioration. Thus, it appears the functional longevity of the raccoon den structures used in

**Table 1.** Number and condition of aged artificial raccoon den structures in central Kentucky, April 1990.

Area	Year erected	N structures erected	N structures located	Structure condition	
				Habitable <sup>a</sup>	Uninhabitable
CWMA <sup>b</sup>	1984	20	17	7 (2)	10
LBAD	1984	20	17	4 (2)	13
CKWMA	1987	6	5	5 (1)	0
Total		46	39	16 (5)	23

<sup>a</sup>The number of habitable den structures that contained raccoons at the time of evaluation is presented in parentheses.

<sup>b</sup>CWMA = Clay Wildlife Management Area, LBAD = Lexington-Bluegrass Army Depot, CKWMA = Central Kentucky Wildlife Management Area.

Kentucky is 6 to 7 years. Other researchers have documented a similar longevity of artificial den structures (Stuewer 1948, Barkalow and Soots 1965).

A recurring problem on many of the 6-year-old den structures was the absence of a bottom. It appeared that the bottoms began to warp as a result of repeated wetting and drying, causing the edges to pull away from the structure's sides (Krantz 1985). To alleviate this problem, bottoms should be recessed (Krantz 1985) and reinforced. Reinforcing materials may include metal L-brackets or 2.54 × 5.08-cm treated lumber. It is also important to keep the inside of the structure dry (Gysel 1961, Barkalow and Soots 1965, Berner and Gysel 1967, Goertz et al. 1975), thus small (0.5-cm diameter) drain holes should be drilled near the bottom.

Although more costly, using treated lumber or bald cypress (*Taxodium distichium*) would increase the longevity of the den structure (Brown and Bellrose 1943, Barkalow and Soots 1965). In this study, an artificial den structure cost approximately \$0.83 a year (assuming a 7-year longevity). Based on price and longevity estimates from lumber-using agencies, the cost of structures made from treated lumber or bald cypress (assuming a 20-year longevity) would amount to approximately \$0.76 a year (Valley Lumber Co., Lansing, Mich., 1991). Studies have not been performed on how lumber treatment effects raccoon occupancy, however, Barkalow and Soots (1965) found no deterring effect to squirrel occupancy resulting from the treatment.

Our data indicated that artificial den structures 3 to 6 years old are used extensively by a variety of wildlife species. In order to have a favorable effect on raccoon population numbers, den structures must be designed to withstand normal climatic conditions for an extended period of time.

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