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GENERAL NOTES

GROWTH MODELS OF LOBLOLLY AND SHORTLEAF PINE RED-COCKADED WOODPECKER NESTING TREES

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The red-cockaded woodpecker (*Picoides borealis* Viellot) was originally found throughout the pine forest region of the southeastern United States (USFWS, 1985) but is now on the endangered species list (USFWS, 1993). Red-cockaded woodpeckers excavate nesting and roosting cavities exclusively in living pine trees. Because of the fragmented nature of stands containing suitable cavity trees in the southern United States, and particularly in the loblolly (*Pinus taeda* L.) and shortleaf (*P. echinata* Mill.) pine stands in the national forests in Texas, intensive management is needed. Information on cavity tree growth parameters is one of many aspects of red-cockaded woodpecker ecology that needs to be explored to devise adequate management plans. The objective of this note is to develop height growth models based on age of loblolly and shortleaf pine red-cockaded woodpecker nesting trees.

Following a series of tornadoes, wind thrown red-cockaded woodpecker nesting trees from the Angelina and Davy Crockett National Forests in Texas were subjected to stem analysis. The trees were broken off in a random fashion by the tornadoes. They were then pieced back together to allow the fallen loblolly and shortleaf pine trees to be cut at the root collar and sectioned at 61 centimeter intervals. A section was removed from the top of each log. These sections were then taken to the laboratory where they were sanded and growth rings

Table 1. Regression coefficients and asymptotic standard errors for the Chapman -Richards function parameters.

Species	Regression Coefficient	Asymptotic Std. Error	r^2
both species			
b_1	113.557	5.818	.969
b_2	0.015	0.002	
b_3	-0.107	0.054	
loblolly pine			
b_1	106.767	9.085	.962
b_2	0.015	0.004	
b_3	-0.147	0.093	
shortleaf pine			
b_1	140.940	8.496	.976
b_2	0.010	0.001	
b_3	-0.206	0.039	

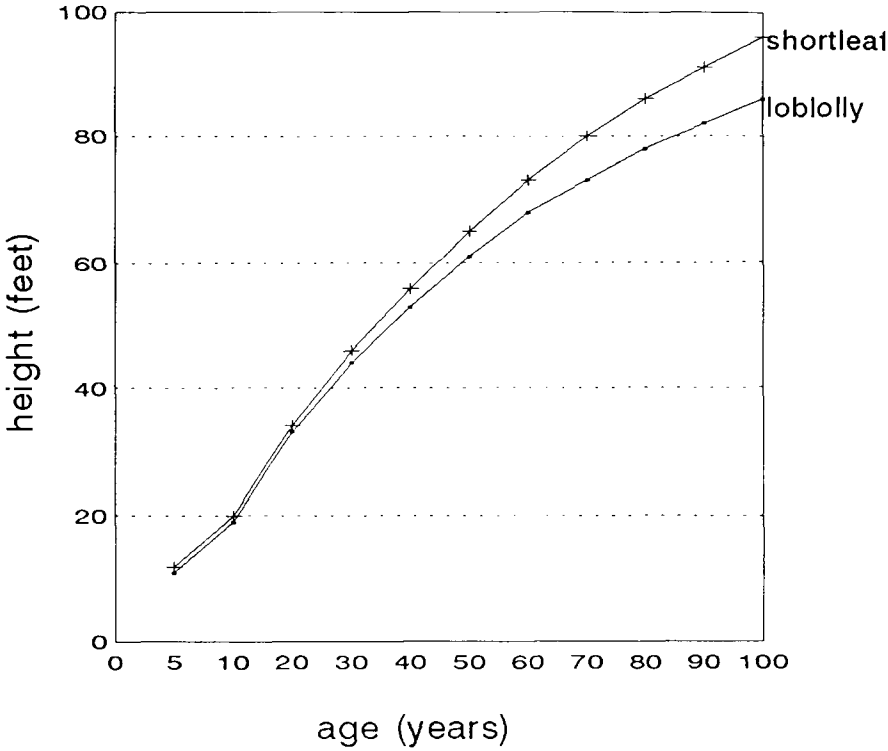

FIGURE 1. Relationship of height (feet) versus age (years) for loblolly pine and shortleaf pine.

counted and recorded. True heights within the bolts of wood were estimated using the technique recommended by Carmean (1972).

Sampled trees ranged in age from 77 years to 123 years with an average of 99 years and a standard deviation of 13.3 years. These trees ranged in height from 23.2 to 32.9 meters with a mean of 27.9 meters and a standard deviation of 3.0 meters. The stem analysis trees yielded 462 height-age pairs, of which, 179 were loblolly pine and 283 were shortleaf pine. Three trees were not used because heart rot rendered them useless. Because these trees were from nesting colonies of an endangered species, it was impossible to extract more data (barring another natural calamity).

A height growth model using the Chapman-Richards (1959, 1961) function:

$$Y = b_1 [1.0\text{-}EXP(-b_2 * Age)]^{(1/1-b_3)}$$

where: Y = Tree height (feet); b_i = parameters to be determined [1]

produced an excellent fit ($r^2 = .969$) when applied to the entire data set. A plot of the residuals showed no adverse biases or trends. The same method was applied to the data by species. Regression coefficients, standard errors, and r^2's for all regressions are shown in Table 1.

After inserting the regression coefficients from Table 1 into the Chapman-Richards function, the following equations resulted:

loblolly pine Height = $106.767 [1.0\text{-}EXP(-0.015 * Age)]^{0.872}$ [2]

shortleaf pine Height = $140.940 [1.0\text{-}EXP(-0.010 * Age)]^{0.829}$ [3]

When plotted, these models display curves (Fig. 1) that follow the growth patterns of trees

selected by red-cockaded woodpeckers for nesting. Because of the limited sample size, these models do not represent the universe of all loblolly and shortleaf pine cavity trees, but may be a useful reference for further studies.

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FIRST RECORD OF A NATIVE AMERICAN ELK (*CERVUS ELAPHUS*) FROM TEXAS

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Reported sightings of American elk in the 1800's (Bailey, 1905) indicate that this species inhabited certain regions of Texas, although there are no modern voucher specimens (Stangl et al., 1994) or fossil records (Dalquest and Schultz, 1992) to substantiate these claims. The first physical evidence of native *C. elaphus* from Texas is reported herein.

On 17 April 1993, the distal portion of a tibia (Fig. 1), identifiable as an adult *C. elaphus*, was found in a cutbank of a small tributary of Pony Creek, 11 km north-northeast of Seymour, Baylor County, Texas. The cutbank exposes fine clay sediments and three layers of gravel, each layer being about three inches thick. The tibia was at the base of the lowest gravel layer, two feet beneath the level of the surrounding flood plain.

The distal end of the tibia of *C. elaphus* differs from that of *Bison bison* in the following characters: longitudinal ridges (muscular lines) found on the posterior side of *B. bison* are absent in *C. elaphus*; a tuberosity present on the anterior side is positioned further from the distal end than in *B. bison* (Fig. 1A); the shaft in *C. elaphus* is more slender than that of *B. bison*.

A radiocarbon (mass spectrometer) date of 295 +/− 50 YBP (Beta Analytic, Inc. #62592) was obtained from a fragment of the bone. It is uncertain whether this specimen represents a member of a substantial population of elk that once lived in the area or only a wandering individual. There are many records of elk from Oklahoma, and a native population existed in the Wichita Mountains until 1881 (Stangl et al., 1992). It is quite possible, taking the wide ranging and migratory habits of this animal into account, that individuals occasionally wandered south from these areas. This specimen is housed in the Midwestern State University Collection of Fossil Vertebrates (MWSU 12946).

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