Model to Predict Arkansas Gray Fox Fur Harvests

James H. Peck  
*University of Arkansas at Little Rock*

Gary A. Heidt  
*University of Arkansas at Little Rock*

Follow this and additional works at: [http://scholarworks.uark.edu/jaas](http://scholarworks.uark.edu/jaas)

Part of the [Environmental Monitoring Commons](http://scholarworks.uark.edu/jaas), and the [Terrestrial and Aquatic Ecology Commons](http://scholarworks.uark.edu/jaas)

**Recommended Citation**

Available at: [http://scholarworks.uark.edu/jaas/vol39/iss1/23](http://scholarworks.uark.edu/jaas/vol39/iss1/23)

This article is available for use under the Creative Commons license: Attribution-NoDerivatives 4.0 International (CC BY-ND 4.0). Users are able to read, download, copy, print, distribute, search, link to the full texts of these articles, or use them for any other lawful purpose, without asking prior permission from the publisher or the author.

This Article is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in Journal of the Arkansas Academy of Science by an authorized editor of ScholarWorks@UARK. For more information, please contact scholar@uark.edu, ccmiddle@uark.edu.
A MODEL TO PREDICT ARKANSAS GRAY FOX FUR HARVESTS

JAMES H. PECK and GARY A. HEIDT
Department of Biology
University of Arkansas at Little Rock
Little Rock, AR 72204

ABSTRACT

Linear regression analysis of total gray fox (Urocyon cinereoargenteus) fur harvests from 1954-1983 in Arkansas showed a high correlation with mean pelt values (r = 0.956). Single variable models using linear regression analyses of current season’s pelt values (CSPV) and previous season’s pelt values (PSPV) were designed to predict fur harvests. These models demonstrated high correlations for predicting harvests (r = 0.933 and r = 0.893 respectively). Regional analyses revealed a high correlation between mean pelt values and harvest for the Ozark Mountain region (r = 0.923), Ouachita Mountain region (r = 0.971), and Gulf Coastal Plain (r = 0.975). The Mississippi Delta region correlation of r = 0.756 suggested the interaction of other unidentified variables. It appears that in Arkansas, gray fox fur harvests can be reasonably predicted by using either the CSPV or PSPV models. These models indicate that declines in the total harvest of gray fox in Arkansas since 1980 are probably due to price declines.

INTRODUCTION

Furbearer management problems have increased in number, scope, and intensity during the past decade in response to 1) rapidly growing demands for furbearers and their products, 2) enactment of endangered species regulations and treaties, 3) a major decline in upland wildlife hunting opportunities, and 4) growing antihunting and antitrapping sentiment (Hubert, 1982). Thus, harvest management programs, now and in the future, require an understanding of the variables which ultimately determine the size of furbearer populations and of subsequent expected harvests (Erickson, 1981; 1982; Hubert, 1982).

Arkansas and other Mid-South states have traditionally used fur harvest data as a primary source of information for estimating the condition of furbearer populations and subsequent management (Erickson and Sampson, 1978; McArdle, 1979; Tumlison et al., 1981; Erickson, 1982; Hubert, 1982). Gray fox (Urocyon cinereoargenteus), is the sixth most harvested species in Arkansas (2% of total pelts) and the third highest in total monetary value (6% of the total furbearer harvest value) (McArdle, 1983). Other aspects of the Arkansas gray fox harvest from the 1939-40 season through the 1982-83 season were summarized, with data provided by furbuyers, trapper surveys, and Arkansas Game and Fish Commission records, in previous reports (Heidt and Peck, 1983; Heidt et al., 1984). Total harvest of gray fox in Arkansas declined steadily from the 1941-42 season, reflecting a decreased price for gray fox since World War II. Mean pelt values were less than $1.00/pelt from the 1946-47 season through the 1965-66 season, while values of greater than $20.00/pelt have existed since the 1975-76 season. Gray fox harvest in Arkansas increased dramatically during the 1970’s and into the 1980’s, demonstrating the impact that increased mean annual pelt prices had on the total harvest of gray fox, particularly from 1976 to the present. The last four harvest seasons (1979-1983) were the largest, third, fifth and seventh largest respectively in the past 40 years of gray fox harvests.

The magnitude of change in pelt values over the last 25 years was sufficiently large ($0.20-40.00) to influence the attitudes and efforts of furbuyers, suggesting that the pelt price might have influenced the magnitude of the Arkansas gray fox harvest. Pelt prices have been demonstrated to play an important role in the harvest of river otter (Lutra canadensis) and bobcat (Felis rufus) in Arkansas (Tumlison et al., 1981; McArdle, 1982) and of raccoon (Procyon lotor) and coyote (Canis latrans) in Missouri (Erickson, 1981, 1982).

The objectives of this study were to quantify the relation between pelt price and annual total harvest of gray fox and to formulate a model to make assessments and predictions of current and future harvests for purposes of management.

METHODS AND MATERIALS

Fur harvest records used in this study were compiled from Arkansas Game and Fish Commission records. The 1964-65 season was omitted from analysis because the data for mean annual pelt value, total gray fox harvested and regional distributions of harvest were unavailable. In the case of the 1979 mean annual pelt value, a value for Arkansas was extrapolated from Missouri pelt prices. No correction factors were applied to the data to correct for out-of-state sales of Arkansas fur. Following the method of Erickson and Sampson (1978), dollar values were uncorrected for inflation. Other potential variables such as gray fox population densities (data not available), trapping season length (relatively constant) and trapper effort (data not available) were not used for this model.

The data were analysed using a statistical program (Statpak by Northwest Analytic, Inc.) on an Epson QX-10 microcomputer. Linear regression equations relating mean annual pelt price (MPV) to the number of pelts harvested/sold (TH) were calculated; the correlation coefficients were tested at the 0.01 level for significance using a one-tailed t-test.

Fur harvest models for gray fox in Arkansas was based upon: 1) the MPV of the current trapping season (CSPV) to predict the current TH and 2) upon the MPV value of the previous season (PSPV) to predict the current TH. A comparison was made between the CSPV model and PSPV model to provide an index to the TH of gray fox in Arkansas and in predicting the number of pelts expected to be sold in Arkansas.
RESULTS AND DISCUSSION

The MPV of Arkansas gray fox were plotted against the TH for each season since 1954 (Fig. 1). A linear regression was then calculated relating the TH of Arkansas gray fox and the MPV (Table 1). The correlation coefficient indicated a high degree of relationship between TH and MPV ($r = 0.956, p < 0.01$). Price accounted for 91% of the variability in the harvest (Table 1).

Two linear regression models were constructed based upon the pelt price for the past 16 seasons (Table 1). The first model used MPV of the current season (CSPV model), while the second model used MPV of the prior season (PSPV model) to predict current harvest. Correlation values of $r = 0.933, p < 0.01$ (CSPV model) and $r = 0.893, p < 0.01$ (PSPV model) were sufficiently strong for biological predictions.

Figure 2 contrasts TH data (reported) with the predicted harvests of the two models (CSPV and PSPV). The two models were equally useful in predicting the harvest of gray fox in Arkansas, and behaved similarly to models of Erickson (1981, 1982) which predicted harvests of two Missouri caninore, the raccoon and coyote. The importance of rising pelt price for Arkansas gray fox pelts in the 1970's was evident as a factor determining the magnitude of harvest.

In an effort to examine how the shortcomings in our models might be improved, we further examined the relation of TH and MPV for each major physiographic region in Arkansas. Heidt et al. (1984) reported that over the past 10 years the Ozark Mountain region had contributed 52% of gray fox pelts sold in Arkansas, the Ouachita Mountain region contributed 26%, the Gulf Coastal Plain contributed 18% and the Mississippi Delta contributed 10%. The Ozark Mountain region showed a decreasing percentage of the harvest; the Ouachita Mountains and the Gulf Coastal Plain showed slight increases. The percentage of harvest from the Mississippi Delta region remained relatively stable, although an increase in total harvest was evident.

Table 1 contains the regression equations for regional gray fox fur harvests in Arkansas since 1954. From this table it can be seen that the first three regions showed a very high correlation between TH and MPV. The Mississippi Delta region, with the lowest correlation, was probably influenced to a greater extent than the other regions by other unidentified factors (e.g. declining gray fox habitat, trapper effort, availability of alternative furbearer species, gray fox abundance, etc.). Further research into variables affecting gray fox fur harvest in the Mississippi Delta region is needed.

In spite of the fact that the models were formulated with a single variable, they accounted for as much variability in the magnitude of harvest (80%, PSPV model and 87%, CSPV model) as was evident in other furbearer harvest models using multiple variables (Erickson, 1981, 1982). The predictive ability of the models was probably enhanced by long-term increases in price during the 1970's and into the 1980's for long-haired, upland furbearers, resulting in increased trapper effort for such species and increased market values. Figures 1 and 2 also clearly suggest that the decline in harvest of gray fox since a high in the 1979-80 season is accounted for by a reduction of the price from $42.50 (1979-80 season) to $26.85 (1982-83 season). Falling pelt prices probably resulted in reduced harvests of gray fox in Arkansas during the 1980-83 seasons.

![Figure 2. Comparison of actual harvests of gray fox in Arkansas from 1954-1983 with predictions using the Current Season's Pelt Value Model (CSPV) and the Previous Season's Pelt Value Model (PSPV).](http://scholarworks.uark.edu/jaas/vol39/iss1/23)
A Model to Predict Arkansas Gray Fox Fur Harvests

CONCLUSION AND RECOMMENDATIONS

While pelt price and total harvest correlations have been previously demonstrated (e.g. Erickson and Sampson, 1978; Erickson, 1982; Heidt et al., 1984), these data would seem to have questionable management implications due to the inability to predict future fur prices. However, for gray fox in Arkansas, our PSPV model using prior season pelt prices demonstrated comparable predictive value to that of the CSPV model. Consequently, this model could be used to provide a portion of the data needed for setting fur harvest regulations and other management decisions regarding gray fox.

The models we presented were based on readily available data, easy to construct and provide timely and useful predictions. Therefore, investigations of other species of species of furbearers, both in Arkansas as well as other states, is warranted. If successful, these models would provide a useful tool for wildlife personnel who make furbearer management decisions.

ACKNOWLEDGMENTS

We would like to thank P. L. Dozhier and L. Johnston for valuable assistance during the study. C. Peck aided in preparing manuscript figures. The Arkansas Game and Fish Commission provided gray fox fur harvest data. The study was supported, in part, by the Arkansas Trappers Association and the UALR College of Science's Office of Research, Science and Technology.

LITERATURE CITED


McARDLE, B. 1979. The status and distribution of the red fox (Vulpes fulva) and gray fox (Urocyon cinereoargenteus) in Arkansas as determined by a mail survey. Rept. to Ark. Game and Fish Comm., Little Rock, AR. 17 pp.

