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HARVEST TRENDS OF THE BOBCAT *(FELIS RUFUS)* IN ARKANSAS

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ABSTRACT

Arkansas bobcat fur harvest records were examined in relation to forest cover, furbuyer distribution, and price. Availability of forest cover correlated with areas of greatest harvest, and a dynamic forest products industry in southern Arkansas is believed to support a greater density, and therefore greater harvest, of bobcats. Comparison of furbuyer distribution with harvest level among physiographic regions suggested that the fur industry in southern Arkansas could expand. Prices increased dramatically in the 1970's, and 94.5% of the variation in harvest level could be explained by price.

INTRODUCTION

The bobcat, *Felis rufus* (Schreber), is the most widely distributed felid in North America (Young, 1958; Cowan, 1971). This secretive mammal is seldom seen, and accurate assessments of its population have been difficult due to the expense of reliable field and laboratory studies. Attempts to assess status through fur harvest records are complicated by the effects of climatic changes, price fluctuations, varying harvest pressures, changes in trapping regulations, and accuracy of fur harvest reports from buyers.

As recently as the early 1970's, bobcats in Arkansas were trapped primarily for predator control (Jenkins, 1971; Fritts, 1973). The value of bobcat pelts during the 1960's and the early 1970's averaged less than $3.25, but by 1978 the value averaged $75.00 and the bobcat had been given furbearer status. This study is the initial phase of a comprehensive study of the biology of the bobcat in Arkansas.

MATERIALS AND METHODS

We analyzed 21 years (1959-1980) of bobcat fur harvest records compiled by the Arkansas Game and Fish Commission (AGFC). The accuracy of these records was questionable: buyers might report county of sale rather than county of provenance. If buyers consistently did this, a significant correlation between by-county harvest and number of furbuyers in counties of apparently high harvest should be evident. Tumlison et al. (1981) examined harvest records for river otters *(Lutra canadensis)* and believed that they were sufficiently accurate to allow regional analyses of harvest. Because harvests of both otters and bobcats must be entered in a log book separate from other Arkansas furbearers, we felt that bobcat harvest records were equally accurate as those of otters.

The AGFC used the four major physiographic regions of Arkansas (Gulf Coastal Plain, Ozark Mountains, Ouachita Mountains, and Mississippi Alluvial Plain or Delta) to group bobcat harvest records. Some physiographic bias exists because the county boundaries of Holder (1951) were used to demarcate regions. Foti (1974, 1976) has shown that two or more regions may occur in certain counties. Still, the effect of this overlap is probably negligible when considering the status of regional or statewide populations.

Harvest records were used to test the hypothesis that, in response to habitat, more bobcats occur (and therefore are harvested) from specific regions. Bobcats prefer habitats with secondary succession, logged forests, or swampland areas with appreciable ecotone or ruggedness (Rollings, 1945; Pollack, 1951; Young, 1958; McCord, 1974; Berg, 1979; Miller and Speake, 1979), rather than cleared blocks. Regional harvests were compared to the amount of forested land remaining in each of the regions, as determined from a map of forested lands in Arkansas (Foti, 1976).

By-county harvest records were available for the seasons of 1977-78 through 1980-81. Assuming an even trapping pressure throughout the state, relative population densities might be estimated by locating areas of consistently high and low bobcat harvests. To facilitate comparisons between years with fluctuating harvest levels, all harvests were adjusted to represent 1000 animals and proportioned among the counties. Additionally, regional harvests were graphed in an attempt to discern trends in relative importance of regions as bobcat pelt producers.

It is unlikely that harvest pressure is even, but it could be argued that an index of relative trapping pressure (or population density) is linked to the number of furbuyers operating within an area; i.e., an equilibrium is attained between the resource (and its renewability) and the utilization of the resource. An area providing a large fur resource would probably support more buyers than an area of more limited resources. The mean furbuyer populace among regions was compared to elucidate this possible relationship.

Harvests are mainly indicative of market trends and, to a lesser extent, of species availability (Erickson and Sampson, 1978; Sampson, 1980). Bobcat harvests were minimal during most of the harvest seasons considered, due likely to low prices offered for pelts during pre-1976 seasons. Price was believed to have had a major influence on the dramatic harvest increase, and this assertion was tested by a linear regression analysis. Price was treated on a dollar for dollar annual basis because Erickson and Sampson (1978) found trapping effort to be more closely tied to observed market prices than fur prices adjusted for inflation.

RESULTS AND DISCUSSION

The acreage of forested lands in Arkansas has decreased rapidly in recent years, especially in the Mississippi Alluvial Plain (Holder, 1969). Planimeter measurements of relative forested acreages between regions indicated that 26% of the Mississippi Alluvial Plain was forested, in contrast to 57%, 66%, and 72% in the Gulf Coastal Plain, Ouachitas, and Ozarks, respectively.

Tumlison (1983) presented maps of by-county bobcat harvests for trapping seasons 1977-78 through 1980-81. A map of the averages for the four years (Fig. 1) gives the most likely view of the harvest levels to be expected from a given county. Some counties fluctuated in reported

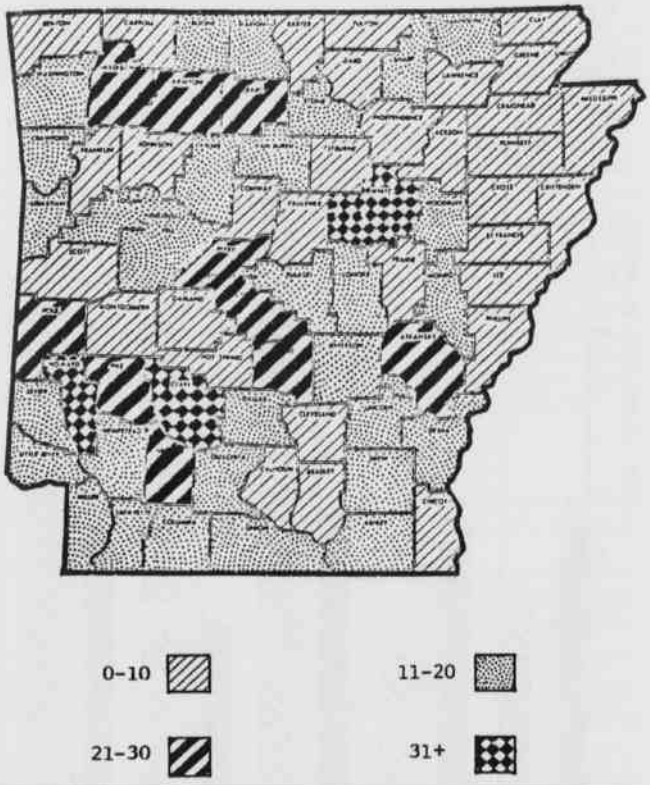

Figure 1. Mean bobcat harvests for trapping seasons 1977-78 through 1980-81. Reported harvest was adjusted to represent 1000 specimens and proportioned among counties.

harvest levels over the four-year period while others were stable. The Mississippi Alluvial Plain is the least forested region of the state (Foti, 1976). Forests of this region primarily occur in the White River National Wildlife Refuge and as narrow strips along portions of some rivers. Relatively few bobcats are harvested from that region (Fig. 1). Generally, regions of heaviest harvest in the Delta are from counties with the most forested habitat, specifically Desha, Arkansas, Lonoke, and Jefferson counties. An entire block of northeast Arkansas counties provides minimal bobcat harvests, probably due to habitat losses. Siegler (1971) believed that reforestation had promoted re-establishment of bobcats in parts of New England. Similarly, reforestation might be required to increase bobcat populations in the Mississippi Alluvial Plain of Arkansas.

The Gulf Coastal Plain and Ouachita Mountain regions of southwestern Arkansas support a large timber industry. Polk, Pike, Howard, Clark, and Nevada counties of these two regions consistently have the greatest bobcat harvest levels, are contiguous, have no geographic barriers to movement, and are located along the border between the regions. Assuming that harvest reports are reasonably indicative of bobcat population densities, this area provides optimal habitat for bobcats. Hall (1973) found areas of heavy undergrowth were important rest areas for Louisiana bobcats, and Miller and Speake (1979) believed that Alabama bobcats benefited from habitat modification created by logging and prescribed burning. Guenther (1980) found significant use of closed canopy habitats as mid-day refugia in Florida. In Missouri, Hamilton (1982) believed bobcats used brushy fields for their high density of prey, oak (*Quercus* sp.) regeneration areas for cover and hunting, and pine (*Pinus* sp.) regeneration areas for diurnal retreats in winter. Jenkins et al. (1979) reported that bobcats were common around well distributed clear-cut timber harvest areas. In the Gulf Coastal Plain and Ouachita Mountain regions of Arkansas, silvicultural practices have been used extensively by several forest resource industries. Although some pine plantations exist, much of the forested lands in these regions is composed of a pine-hardwood mix (Foti, 1976). Pine and oak regeneration areas are common, and thickets of early successional undergrowth are numerous. Because previous habitat use studies consistently indicate that such habitats are preferred by bobcats, the consistently high harvests reported from these areas may be a function of relatively high bobcat density.

The Ozark Mountains normally provide an appreciable bobcat harvest, with a harvest nucleus in Madison, Newton, and Searcy counties. Although the Ozarks contain the largest relative acreage of forests in Arkansas, the lack of a dynamic wood products industry creating continual disturbance and regeneration probably results in a lower density of bobcats. The area of greatest harvest contains much of the Buffalo River, noted for its rugged terrain, and includes a vegetational distinction in the presence of shortleaf pine *(Pinus echinata)*. Most of the rest of the Ozark forests are in climax oak-hickory (*Carya* sp.) (Foti, 1976). Berg (1979) found that bobcats used coniferous cover disproportionately to its relative abundance in Minnesota and McCord (1974) found that hardwoods were selected against as winter habitat in Massachusetts, possibly due to excessive cooling as compared to coniferous habitats. Hamilton (1982) found bobcats in the Missouri Ozarks increased their use of bluffs during winter, and suggested hardwoods might be selected against during winter because of increased energy demands of travelling in deep snow, increased wind, high radiation losses, and lower nighttime temperatures in such cover. Perhaps these factors also explain the distribution of the bobcat in the Arkansas Ozarks.

Figure 2 shows harvests by region for the years preceding the dramatic price increase, and Fig. 3 shows harvests subsequent to them. Through most of the 1960's and much of the 1970's, the primary source of bobcat pelts was the Ozark Mountains. Many people in the Ozarks own small farms with limited numbers of domestic animals. Real or feared depredation on domestic animals by bobcats often led to predator control efforts, and pelts from some of these specimens probably made it to the fur market in the Ozarks. Livestock depredation was likely less important in the Delta where loss of habitat reduced bobcat populations. Further, the value of a pelt during those years rendered bobcat trapping uneconomical, and specimens were regarded as trophies rather than sources of income. Therefore, early trapping records for bobcats are especially poor indicators of density.

As pelt prices became more attractive in the mid-1970's, harvests in all regions increased rapidly (Fig. 2). Regional harvests remained relatively proportional until the 1976-77 season (Fig. 3), when the Ozarks had an increase of almost 4X the harvest of the previous season (approximately 1000 specimen increase). The great increase in take from the Ozarks probably reflects a tremendous increase in trapping pressure due to pelt price. Mean pelt price increased from $36.60 to $52.81 between 1975-76 and 1976-77. Harvest records from the subsequent trapping seasons suggested a decline in the relative contribution of the Ozarks to Arkansas bobcat harvest. Whether this decline represents a true drop in the importance of the Ozarks due to over-exploitation or simply gains in the relative importance of other regions is unclear. However, it seems plausible that the uncharacteristically heavy harvest in the Ozarks in 1976-77 reduced populations and affected subsequent harvests through reduced density. By the 1979-80 season, the Ozarks again led in bobcat pelt production. Whether this means the population had recovered or that the other regions had been equally affected by increased pressure remains for speculation.

The average number of furbuyers during the five seasons from 1976-77 through 1980-81 indicated more buyers in the Delta (69) and Ozarks (63) than in the Ouachitas (35) and Gulf Coastal Plain (27). During the same period, the mean number of furbearer pelts harvested was 44,329 for the Gulf Coastal Plain, 48,340 for the Ouachitas, 72,858 for the Ozarks, and 111,253 for the Delta. Assuming the number of furbuyers operating in an area indicates the capacity of the fur resource to support them, it appears that the Delta and Ozarks provide the greater resource. The mean number of pelts per buyer was estimated from these figures and it was assumed that the minimum value represented the minimum pelt production under which a buyer could gainfully operate. However, further analysis required that the nature of the harvest be the same among regions, which was not true. Harvest figures in the

Harvest Trends of the Bobcat *(Felis rufus)* in Arkansas

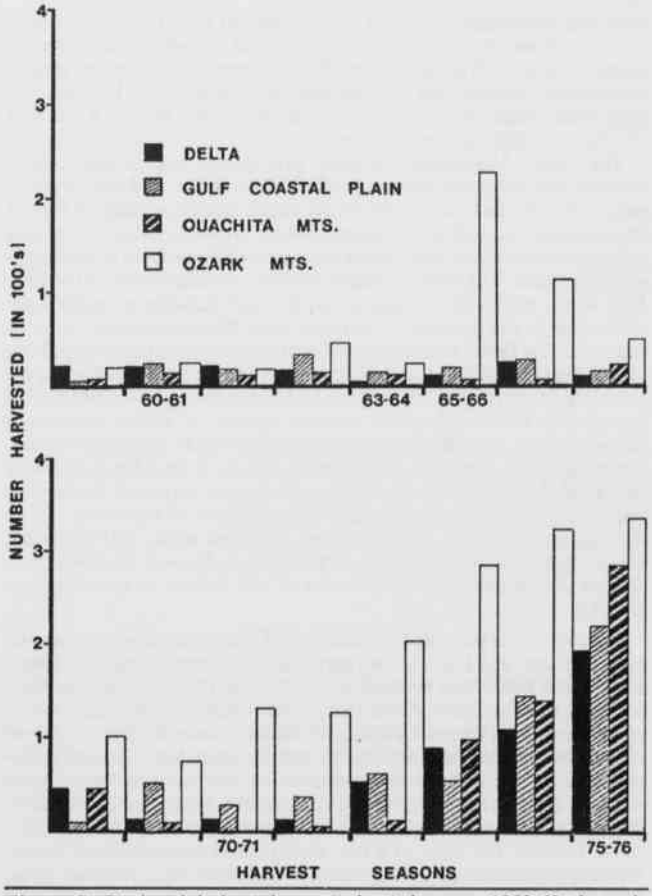

Figure 2. Regional bobcat harvests in Arkansas, 1959-60 through 1975-76.

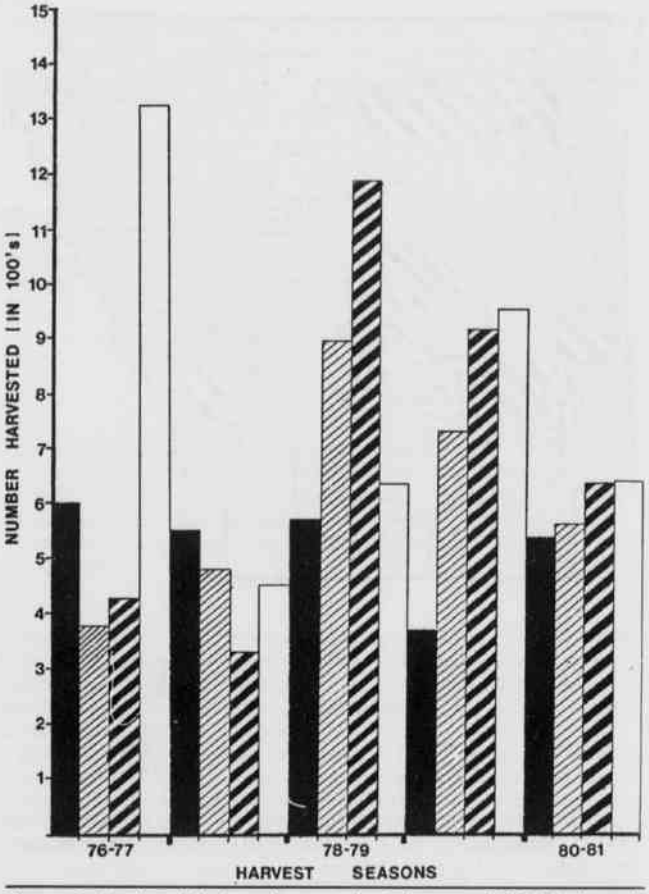

Figure 3. Regional bobcat harvests in Arkansas, 1976-77 through 1980-81. Legend as in Figure 2.

Delta were biased upwards by disproportionate occurrence of mink *(Mustela vison)* and muskrat *(Ondata zibethicus)*. Furs of greater value are more commonly bought in non-deltaic regions — specifically bobcat and gray fox *(Urocyon cinereoargenteus)*. Although more animals are harvested in the Delta, the species composition and average pelt value is different, making the Delta unsuitable as a base for comparison with other regions. The Ozarks support one of the largest buyer populations and have the second largest harvest, and buyers in the Ozarks average the lowest number of pelts among regions. Further, the Ozarks are similar to the Ouachitas and Gulf Coastal Plain in average pelt value and species composition of the harvest. The Ozarks, then, best meet requirements for the minimum conditions for buyer operation, and can be used as a base for comparison.

If business in the Ozarks is profitable and the resource is not overexploited, the Ouachitas and Gulf Coastal Plain can withstand additional trapping pressure, assuming the fur resource is equally available among these regions. Comparison of age structures of bobcats from these regions supports this opinion (Tumlison, 1983). If this is true, bobcat density in the Ouachitas and Coastal Plain may be underrepresented by harvest figures. The low number of buyers in the Coastal Plain and Ouachitas likely do not indicate that the fur resource is limited. Rather, the lack of buyers in many counties of these regions may tend to decrease trapping pressure due to the distance prospective trappers must travel to sell their catch. Further, several buyers from the southern Ouachitas and western Gulf Coastal Plain make weekly circuits to buy fur in the middle and eastern Gulf Coastal Plain. This suggests that there is room for an expanded trapping industry in southern Arkansas, and that densities of bobcats in the Ozarks as inferred from harvest records are not comparable to those inferred from harvest records from southern Arkansas.

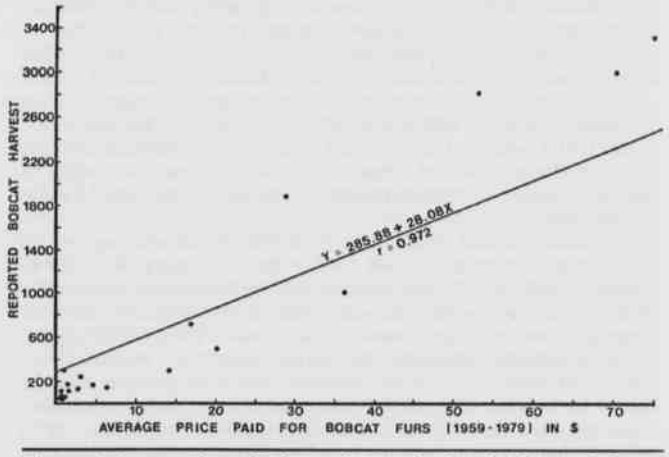

Figure 4. A regression of price on harvest levels of Arkansas bobcats for seasons 1959-60 through 1979-80.

Ford (1971) first expressed the opinion that bans on trade in certain endangered spotted cats would have an effect on the use of bobcat fur. The effect was increased prices for pelts, with concomitant increases in harvest pressure. In Arkansas, the mean price of $75 during the 1978-79 season resulted in the highest bobcat take (3278) in Arkansas history. Harvests declined during the next two years, partially in response to lower prices which were brought about by court battles over export

of bobcat pelts; buyers were afraid they could not export the pelts so were less willing to buy them, and trappers reduced their efforts to catch bobcats. Therefore, the declining trend in harvests may not be attributed to population declines from over-harvest, but rather is due to extrinsic effects of politics.

Linear regression analysis of average pelt price and harvest level (Fig. 4) suggested an average of 28 more bobcats were taken for each dollar increment in pelt value. Harvest level was highly correlated with price ($r = 0.972$), and the regression model explained 94.5% of the variation. Because so much variation is explained by the price model, it is difficult to see that much information on densities can be gained through analysis of harvest records. Statistically, only about 5.5% of the yearly harvest variation could be attributed to density. As has been shown earlier, there is little evidence in the data that supports the contention that population level or density is reflected in harvest figures. Still, harvest figures provide insight into population status and allow researchers and managers to direct their approach by identifying potential problems.

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