Texas Mountain Lion Status Report

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Population Trends

Indirect measures of population abundance, such as harvest data, are often used to make inference on long-term population dynamics when direct data are either not available or are logistically difficult to obtain. Although harvest data has inherent problems in that it is dependent upon effort, not necessarily on whether the population is increasing or decreasing in number, Texas Wildlife Damage Management Service (TWDMS) provides a long-term dataset for trend analysis. TWDMS responds to wildlife damage complaints. Assuming that damage complaints and removals would increase with an increasing mountain lion population, TWDMS harvest data indicates a significant increasing number of mountain lions being removed from 1919 to 2006 ($R^2 = 0.25$, $P < 0.001$). There are 2 evident periods where harvest increased; 1920 thru 1940 ($R^2 = 0.501$, $P = 0.0002$) and 1970 thru 2003 ($R^2 = 0.53$, $P = 0.002$). Trend analysis tells whether a particular data set has increased or decreased over a period of time, although it suffers from a lack of scientific validity in cases where other potential changes (e.g., effort, funding, and nonrandom sampling) can hinder estimation (Fig. 1).

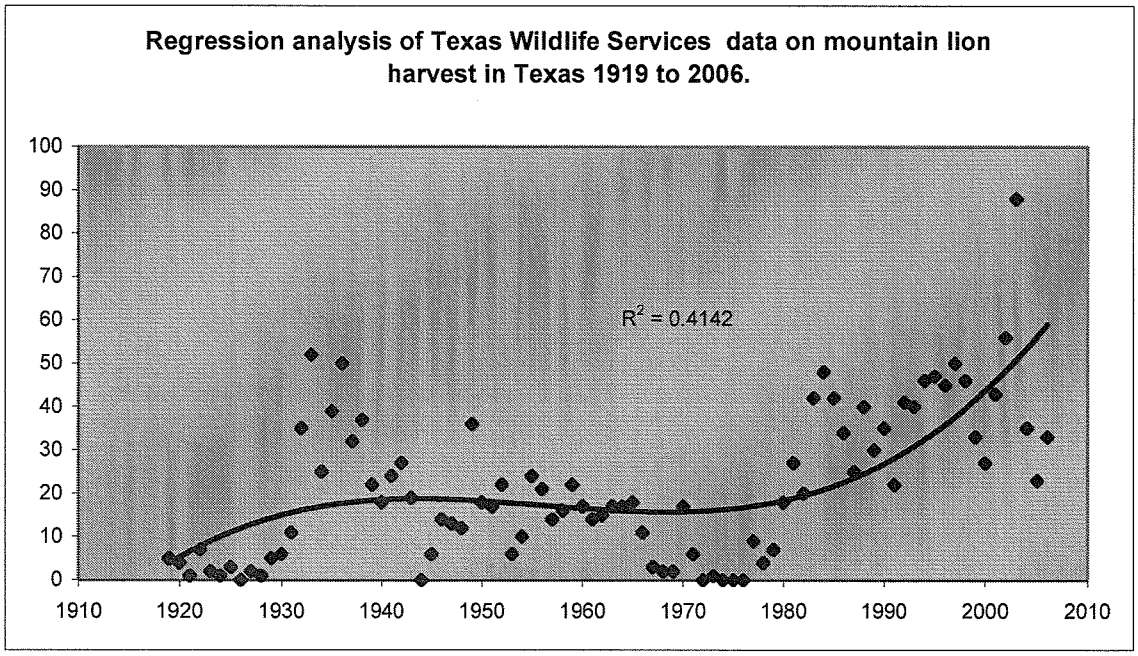

Figure 1. Polynomial regression analysis of harvest data from Texas Wildlife Services from 1919 to 2006.

Genetic Monitoring

A recent study by Janecka et al. (In review) provides some insight into mountain lion population structure and genetic diversity. Analysis of 18 microsatellite loci in 89 mountain lions revealed moderate levels of genetic variation (H_o = 0.36-0.48) characteristic of mountain lion populations in North America. Long-term effective population size for mountain lion in Texas was estimated to be 5,607 animals. This is well in excess of 500 animals which is the proposed minimum effective population size (Franklin 1980) for long-term population viability and is comparable to estimates for mountain lion in Wyoming (N_e = 4,532) (Anderson 2004) and Utah (N_e = 5,732) (Sinclair et al. 2001). However, these estimates need to be interpreted with caution because they reflect long-term effective population size and not current population size. The patterns in genetic variation suggest mountain lions in Texas exist as metapopulations and the populations between South Texas and the Trans-Pecos are isolated by distance. Further investigation into genetic variation using bone samples from historic mountain lion samples in museums will provide an opportunity to evaluate changes in genetic diversity over time but is currently dependent upon available research funding and may take some time to complete.

Distribution Prediction

Recently we have utilized ecological niche modeling and the Genetic Algorithm for Rule Set Production (GARP) to estimate potential distribution of mountain lion in Texas (John Young, unpublished data). A predicted niche area was developed using GARP, mountain lion occurrences throughout the US, and environmental coverage information for the US. Texas was then extracted and the prediction was refined by eliminating portions of the predicted niche using roads, urban areas, and land use-land cover (Martinez-Meyer et al., 2006). At the 1-km^2 spatial scale, GARP predicts potential mountain lion distribution in Texas in the Trans-Pecos, Edwards Plateau, South Texas, Llano Uplift, southern Rolling and High Plains and disjunct areas in the northern High and Rolling Plains, Blackland Prairie, Oak Woods and Prairies, and Gulf Coastal Plains Ecoregions (Fig. 2). Although our model predicts potential distribution in areas of Texas where mountain lions have not been recently confirmed (e.g., Gulf Coastal Plains), Peterson (2006) states that some suitable areas are expected to be uninhabited and does not necessarily imply over-prediction. While GARP predicts an appropriate ecological niche in the Gulf Coastal Plains, Blackland Prairie, and Oak Woods and Prairie Ecoregions, the density of roads and human residence make it unlikely that resident mountain lions are present (Van Dyke et al. 1986, Beier 1996).

Human Interaction Protocol

In 2006, due to concerns over an apparent increase in mountain lion sightings in suburban and urban areas, TPWD convened a panel to develop a Mountain Lion Human Interaction Protocol. A protocol was implemented in January 2007 and a formalized database for recording sightings and human interactions was developed. The protocol established interaction classes, defined aggressive behavior and no-tolerance zones, and guidelines for response based on interaction classes were developed. In 2007, staff recorded 119 cases regarding mountain lions from within urban/suburban areas; 35 (29%) resulted in a formal field investigation.

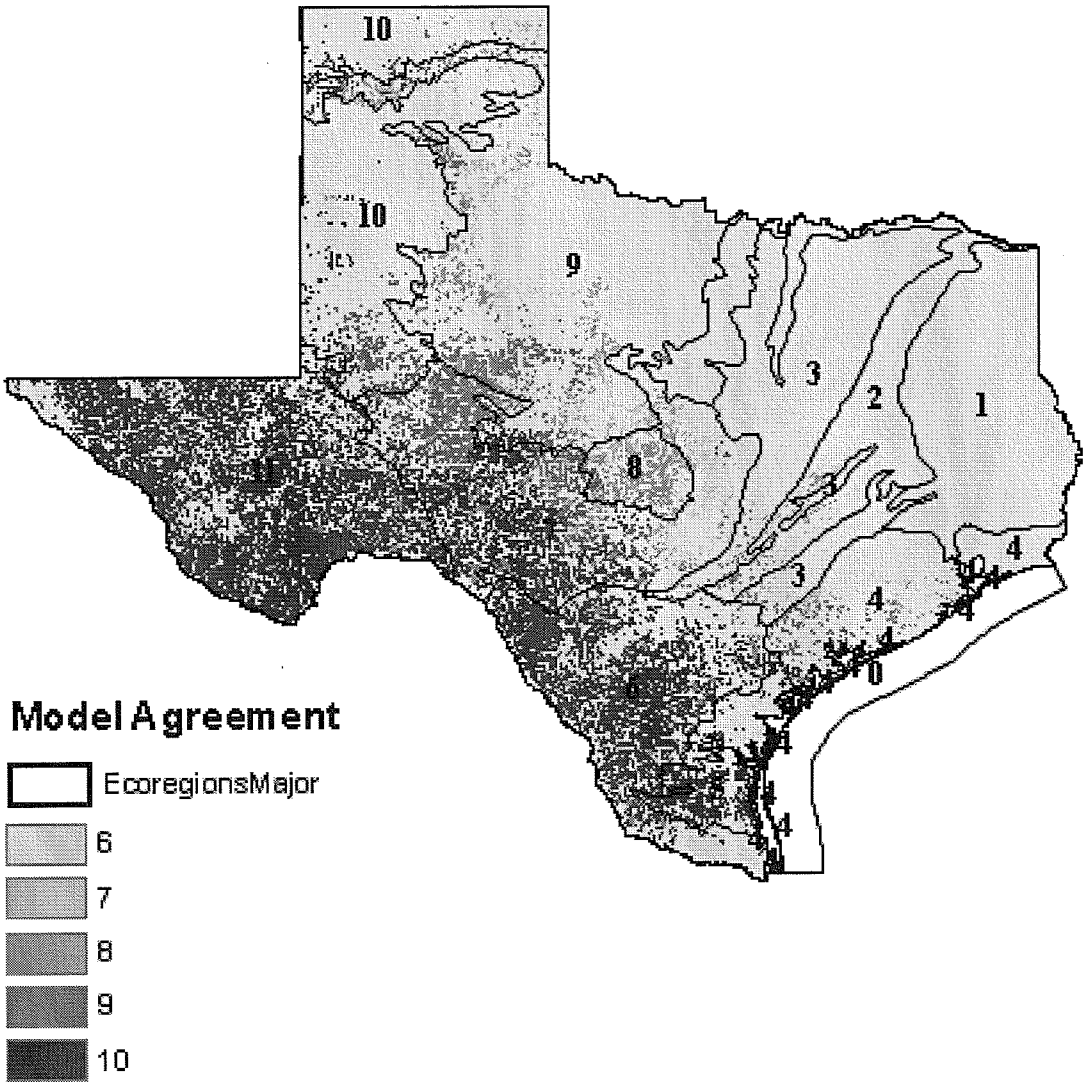

Figure 2. Predicted distribution of mountain lions in Texas based on ecological niche modeling with the genetic algorithm for rule-set production. The 11 Ecoregions are: (1) the Pineywoods, (2) Oak Woods and Prairies, (3) Blackland Prairie, (4) Gulf Coast Prairies and Marshes, (5) Coastal Sand Plain, (6) South Texas Plains, (7) Edwards Plateau, (8) Llano Uplift, (9) Rolling Plains, (10) High Plains, and (11) Trans-Pecos. Darker colors mean greater likelihood of mountain lion presence.

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