



## OREGON DEPARTMENT OF FISH AND WILDLIFE

### CONCEPTUAL FRAMEWORK TO ESTIMATE STATEWIDE COUGAR DENSITIES

#### Summary of Pilot Studies

The Oregon Department of Fish and Wildlife (ODFW) developed a novel technique to estimate cougar densities. The advantages of this technique over traditional methods to estimate cougar densities are 1) repeatability, 2) can be conducted over a short time window (1-2 months of field work versus years for 1 study area), 3) provide confidence intervals about the population estimates, and 4) less expensive to conduct. Researchers used trained detection dogs to search for cougar scat within the Mt. Emily Wildlife Management Unit (WMU) during 2011 and 2012. Detection dogs were trained to work with a handler that would reward the dog with approximately 2 minutes of play with a tennis ball when locating cougar scat in the field. On average, detection dogs and their handlers covered 10 km of search area per day during surveys. Over the course of 36 surveys, detection dog teams covered 365 km and collected 272 scat samples within a 220 km<sup>2</sup> sample area during 2011. Over 36 surveys conducted in 2012, detection dog teams covered 392 km and collected 310 scat samples within a 225 km<sup>2</sup> survey area or about 15% of the WMU. Costs associated with leasing detection dogs ranged from \$450 - \$500 per day (G. Davidson, Find It Detection Dogs, personal communication). Scat samples were submitted to a genetics lab at University of Idaho for analysis. DNA was extracted from scat samples and the DNA was used to determine species, sex, and individual identification for each sample. Exposure to sunlight, moisture, and high temperatures can degrade genetic samples. Extracting DNA from fecal samples is difficult and depends on the quality of the submitted sample. Consequently, some samples submitted for genetic analysis did not result in individual identification. Individual identification was determined from 73 samples that represented 21 cougars (9 males and 12 females) in 2011. During 2012, individual identification from 53 samples represented 18 cougars (7 males and 11 females). DNA amplification success rate during 2012 (30%) was lower than observed during 2011 (43%) which may be a consequence of 2012 surveys being conducted during fall. Costs associated with processing genetic samples were approximately \$75 per sample collected. Spatial capture-recapture (SCR) models were used to estimate cougar densities in the Mt. Emily WMU. SCR models combine the spatial location of each genetic sample to estimate densities of animals on the landscape. The SCR models estimated densities of 5.1 and 5.8 cougars/100 km<sup>2</sup> or 13.5 and 15.25 cougars/100 miles<sup>2</sup> during 2011 and 2012, respectively. The similar density estimates between years highlight the effectiveness and repeatability of this technique. The estimates of density were relatively imprecise however, which was likely a function of the relatively small sampling area to that of cougar home-ranges. Sampling a larger area would likely increase the precision of the density estimates. Alternatively, more intensive sampling at within the survey area would increase recapture rates and improve precision in estimates, but this would come at an increased financial cost.

#### Additional Information Required to Estimate Statewide Cougar Densities

While the pilot study efforts to estimate cougar densities at a localized scale demonstrated the utility of research approach, several key issues need to be addressed to implement the technique at a larger (e.g., WMU or habitat type) or statewide scale including:

1. Reason for estimating density of cougars (i.e., evaluate target area, assess effects of cougars on prey populations, maintain minimum population viability)



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2. Scale of inference: Is the population density needed by habitat type, management unit, or broad ecological unit?
3. Level of accuracy and precision needed for the estimates.
4. Spatial arrangement of surveys required: uniform, clustered, random, or stratified.

These issues can be partially addressed without collecting additional data. Simulations of datasets would allow identification of the sampling scheme and amount of survey effort that produces the least biased and most accurate estimates of cougar density for the appropriate scale of inference. For example, it would be premature to design a sampling scheme for an entire WMU without first evaluating some of the factors listed above through a simulation approach if one wants to be as efficient and cost-effective as possible.

If one was to design a sampling scheme for a larger areas (e.g., WMU) without additional information on the sampling design obtained through simulation modeling, the scheme would have to be extensive, probably 3-4 times larger than was sampled with one of the annual surveys in the Mt Emily WMU (225 km<sup>2</sup>). Using information from simulated data, a second generation of sampling could be developed to improve efficiency, reduce confidence intervals, and potentially reduce costs. This will allow us to assess if this technique is financially feasible on a large spatial scale prior to using valuable conservation and management dollars on an impractical approach.

### **Conceptual Framework to Estimate Statewide Cougar Densities**

After addressing issues associated with conducting scat surveys on a large spatial scale, the potential exists to develop a statewide sampling scheme to estimate cougar densities. SCR models can be modified to incorporate the effects of habitat, prey density, or any other relevant landscape features on cougar densities. Developing a statewide sampling scheme where sampling areas are placed in a variety of habitats, with a mixture of prey populations will allow us to directly test for effects of these variables on cougar density. This approach would allow ODFW to develop a predictive map of cougar densities across the state. After any potential relationships between cougar density and landscape variables have been developed, integrated population models could be developed that could incorporate estimates of cougar density, demographic rates, and harvest rates to predict population dynamics of cougars over time.