

### **Updated Model Used to Estimate Black Bear Habitat in New Mexico**

Black bears are cryptic, mainly solitary animals that prefer areas with dense cover, and therefore cannot be directly counted through aerial or ground surveys. Population estimates are derived through collecting field data on individually marked animals and applying population reconstruction or mark-recapture methods to the data. Density estimates generated for mountain ranges or specific habitat types can be extrapolated to similar areas around the state.

The current habitat model for black bear population estimation in New Mexico was generated as part of the 8 year Black Bear Ecology Study (hereafter 2001 study, Costello et al. 2001) conducted 1992–2000 (Fig. 1). This habitat model utilized the original New Mexico Gap Analysis Program (NM GAP) land cover classification which was designed to predict species distribution based on habitat type. The NM GAP model was used in conjunction with information gathered from 316 VHF radio-collared bears across 2 study areas, and mast production potential by habitat type, to predict primary, secondary, and edge habitat across New Mexico. The habitat model was intended to be updated as new information became available (Costello et al. 2001, p. 111). Advances in technology such as more detailed and accurate land cover classifications (the LANDFIRE land cover classification), ability to identify individual animals through genetic techniques (Boerson et al. 2003, Lukacs and Burnham 2005), improved spatial data, and more accurate statistical methods provide an opportunity to develop more accurate population estimates.

Substantial improvements in habitat classification accuracy and the ability to separate habitat type from cover density were important developments in the new LANDFIRE datasets. The number of habitat classifications increased from 42 to more than 150 allowing for fine-scale classification of multiple habitats in areas where there was previously only one. For example, the NM GAP model accurately predicted Rocky Mountain/Great Basin Open and Closed Conifer habitat types, which are very important for black bears in New Mexico, approximately 28% and 15% of the time, respectively (Thompson et al. 1996). LANDFIRE separated these into multiple vegetation classifications, each with 10 canopy closure classifications, and the resulting model accurately predicted the analogous habitat types approximately 88% and 79% of the time, respectively (Stehman 2012). Cover type classifications can vary year to year depending on precipitation, fire, and successional stage. The updated habitat model (Fig. 2) is based on LANDFIRE data for 2008, 2010, and 2012, which improved the robustness of the final model as it is not dependent on a single year of data.

Advances in radio-collar technology including use of GPS locators allow biologists to locate bears regardless of where they travel. Traditional VHF technology restricts observation to a limited radius around the individual, resulting in missing locations when the animal travels long distances. GPS technology has revealed that bears in New Mexico travel longer distances than previously documented, meaning that populations can be further from each other (Liley and

Walker 2015), and in smaller habitat patches than previously believed because populations can remain sustainable with fewer individuals as long as sufficient breeding is maintained through males moving through different population patches.

Population estimation techniques have also improved. The 2001 study captured and marked as many bears as possible over the 8 year study period, and used population reconstruction methods to estimate population size. The study assumed not all resident bears were captured; therefore, population estimates were considered minimum, not average, population sizes (Costello et al. 2001, p. 88). In contrast, hair-snare studies use DNA from hair samples left at multiple study locations during multiple time periods to identify individuals, and do not require handling the animals. Data are analyzed using recently developed spatially explicit capture-recapture statistical methods which are more accurate and more informative than previously used methods (Gardiner et al. 2010). Genetic hair-snare studies are currently the technique of choice and there are multiple publications in peer reviewed journals describing methodology and results. This technique is being employed in multiple sites around New Mexico to more accurately estimate bear densities.

# Predicted Suitable Habitat for Black Bears in New Mexico

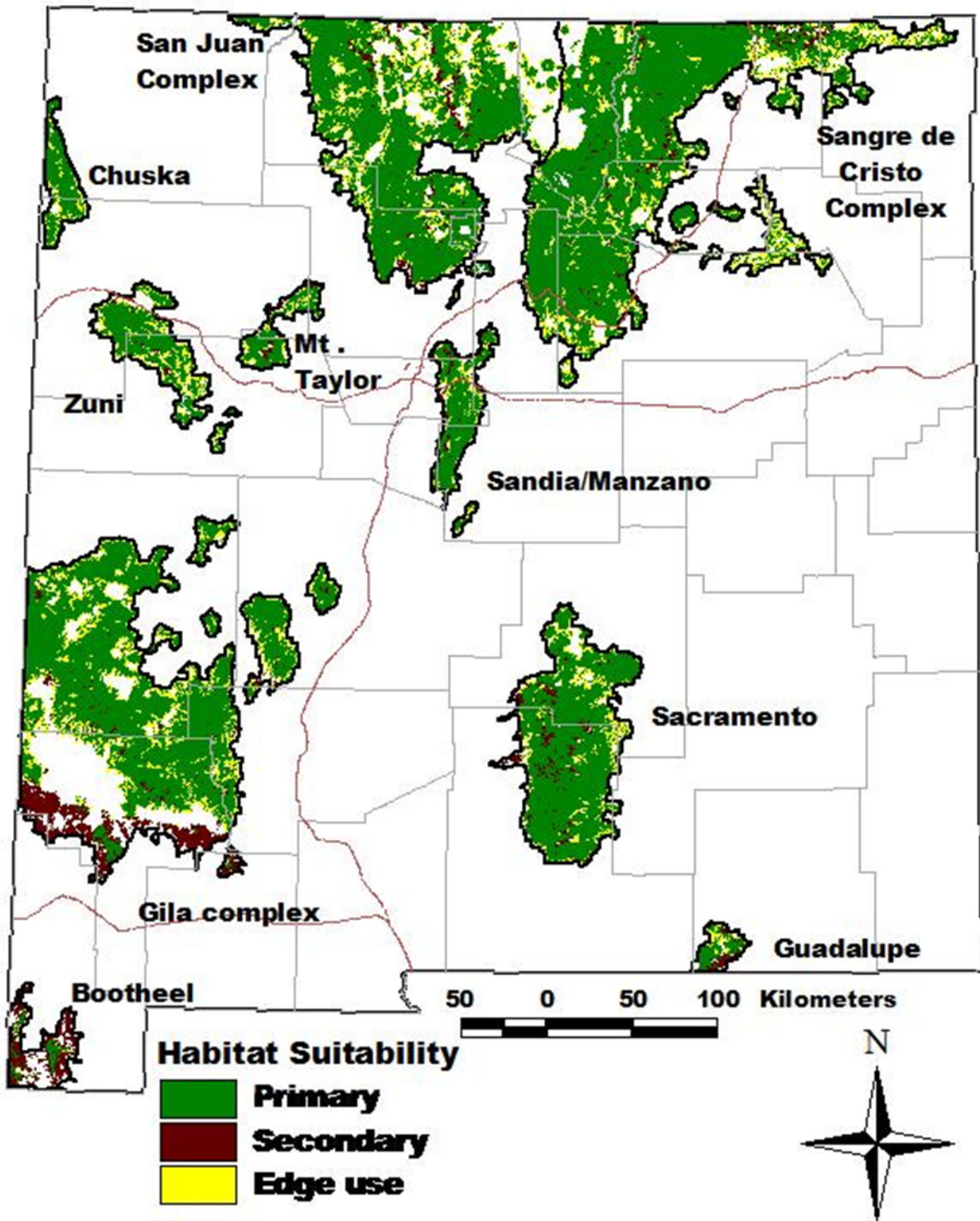


Figure 1. Predicted suitable habitat for black bears in New Mexico from Costello et al. 2001.

## Predicted Black Bear Habitat in New Mexico

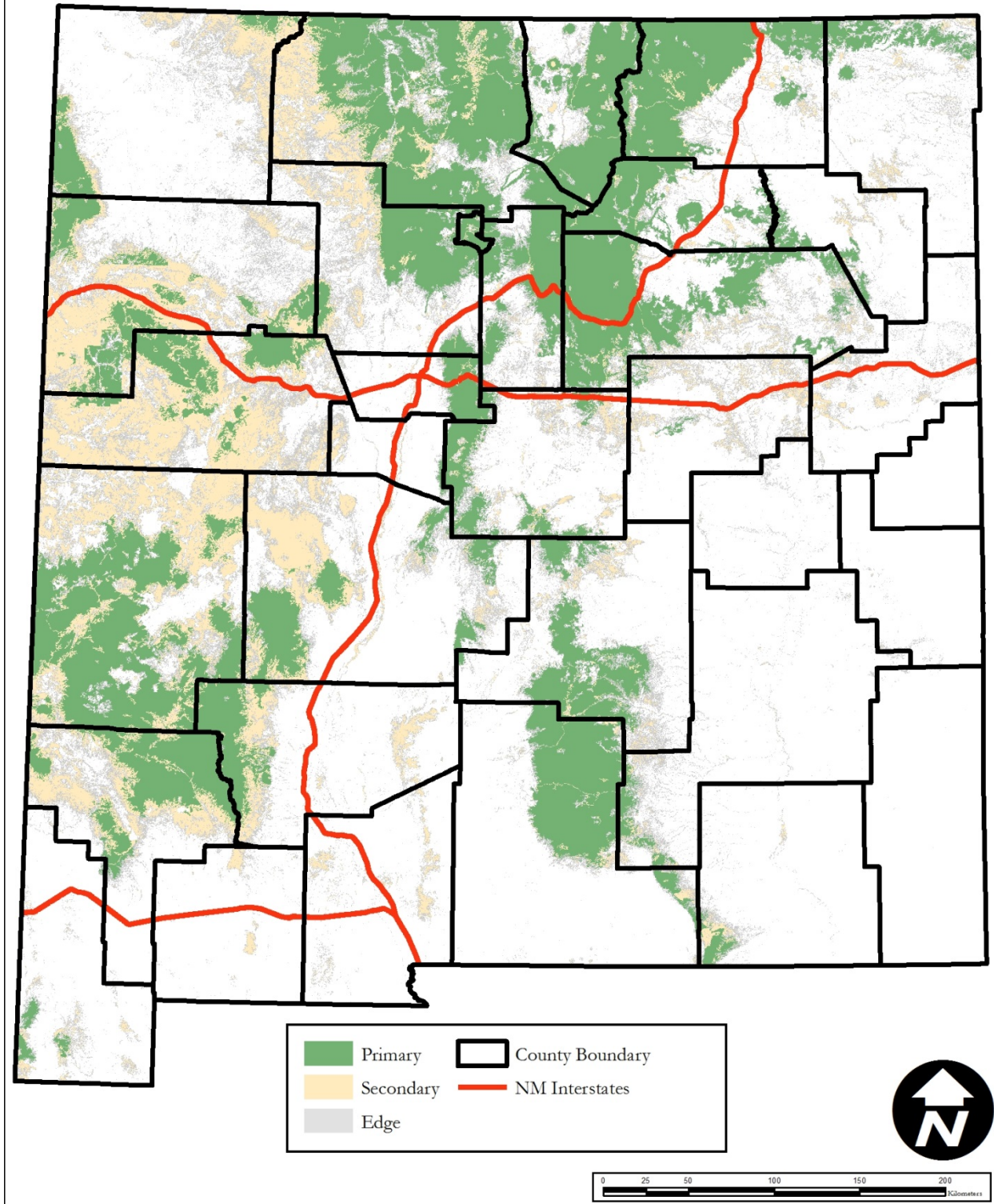


Figure 2. An update to predicted black bear habitat in New Mexico, 2015.

## Literature Cited

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