FOURTH QUARTER REPORT OF THE SIERRA NEVADA BIGHORN SHEEP RECOVERY PROGRAM

Photo by Todd Vogel

OCTOBER-DECEMBER 2008

SIERRA NEVADA BIGHORN SHEEP RECOVERY PROGRAM CALIFORNIA DEPARTMENT OF FISH AND GAME

BIGHORN DEMOGRAPHY

The survival rate for bighorn ewes that wore radio-collars during the 4th quarter of 2008 was 96%; 2 radio-collared adult females were preyed upon by mountain lions. Ram survival during October - December 2008 was 100%. Annual survival for 2008 portrays a less optimistic status. Annual survival across the entire population during 2008 was 81% and 63% for adult ewes and rams, respectively. As ewe survival declines below 90%, it begins to raise concern that populations may decline depending upon accompanying levels of lamb recruitment. More detail relative to specific herd units will be provided in the annual report. We are currently analyzing demographic rates (survival and reproduction) and population estimates in combination to identify herd units where rates may be of concern and to determine the factors that may be limiting recovery.

Photo 1: Radio collared ram preyed upon by mountain lion on Wheeler Ridge during January 2008.

RANGE EXPANSION BEYOND THE MT. LANGLEY HERD UNIT

In October 2008, a ewe carcass was found northeast of Crabtree Lake by a Sequoia-Kings Canyon National Park backcountry ranger. The Recovery Program used this opportunity to investigate the mortality, as well as search for bighorn, tracks, and other sign that could help identify range expansion. Two investigators traveled into the Crabtree area and spent 3 days exploring and searching for sign. Although the investigators did not locate the bighorn sheep carcass discovered by the ranger, they found indications of bighorn sheep use. A number of discernable sheep tracks were identified. The most notable led down a chute from Mt. Newcomb to the meadows surrounding Crabtree Lake, suggesting a commonly used travel route. More than half of the fecal samples found during the investigation were from the current year but indicated use in previous years as well. And finally, when exiting the area, the investigators identified a single left foreleg of a bighorn sheep near Discovery Pinnacle. Unfortunately, it cannot be certain if this leg was scavenged from the dead ewe or if it belonged to a new, undiscovered mortality. More recently location data was retrieved from a GPS collar worn by a bighorn female. The data from the collar also revealed bighorn use beyond the herd unit in the vicinity of the Crabtree Lakes and is consistent with the findings of the ground survey (Figure 1).

There is prior documented use of the Miter Basin by ewes and rams as well as occasional ram sightings in the Mt. Whitney area, however, use of the terrain west of these geographical features has not been documented until now. There is certainly high quality alpine habitat available in the areas where this range expansion is occurring and beyond. Based on our investigation and the GPS collar data, it is clear that ewes have used the Crabtree Lakes area this past year as well as previous years, especially the ridge leading to Discovery Pinnacle and parts of Mt. Newcombe. This is exciting news as it suggests western expansion beyond the Mt. Langley Herd Unit. It is important to monitor this area for future bighorn use. Our western survey routes will be extended to include Crabtree Pass as well as the western ridges of Discovery Pinnacle and Mt. Newcombe.

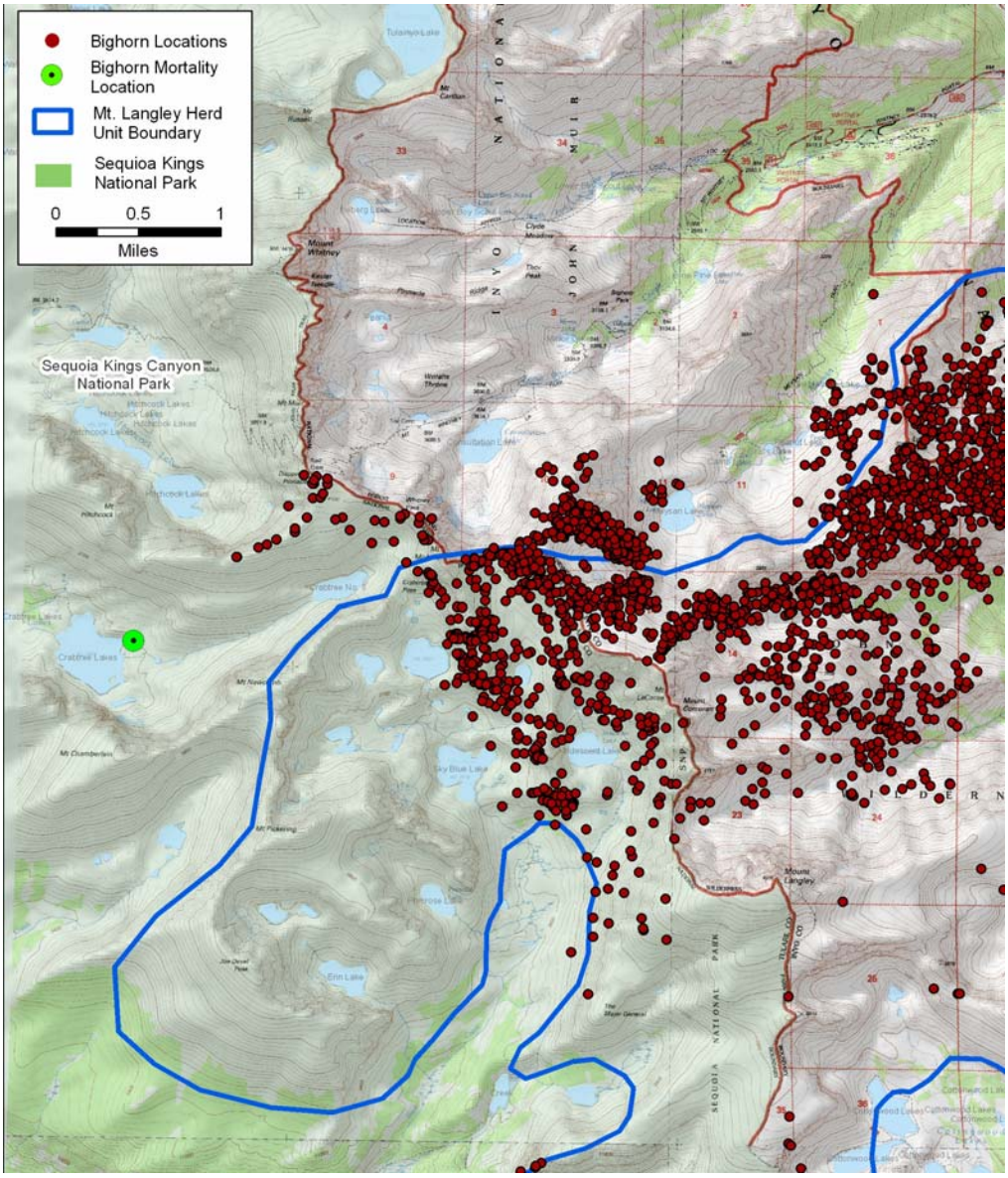

Figure 1: Range expansion beyond the Mt. Langley herd unit documented from GPS collar data and remains of bighorn mortality.

MT. BAXTER AND SAWMILL CANYON LOW ELEVATION WINTER RANGE HABITAT ASSESMENT

Bighorn sheep select habitat based on the divergent needs of forage quantity, forage quality and predator avoidance. We are currently in the midst of an effort that will produce a low elevation (1500 – 2500 m) habitat map that integrates these components. Previous bighorn sheep habitat maps have included terrain variables (elevation, aspect, slope and distance to escape terrain) as well as a land cover type, yet they lacked an adequate forage component. We plan to develop a map of forage quality and quantity that can be integrated into future habitat selection analyses. Integral to a model of forage biomass and quality is a land cover classification. In this preliminary analysis, we examined the predictions of different land cover classifications [National Land Cover Database (NLCD) and CALVEG] based on the variance of

green grass and forb biomass from ground sites. In addition, we performed a rough analysis of selection based on the ratio of used / available to compare the different classification systems and determine which cover types are relevant for bighorn. This effort was motivated by a large natural fire that burned much of the lower elevation winter habitat of the Mt. Baxter and Sawmill Canyon herds and the need to understand the fires effect on bighorn habitat (see cover photo of bighorn using Seven Oaks Fire and note vegetation regrowth). Nevertheless, this work will likely provide insight into habitat selection on other occupied and historic ranges.

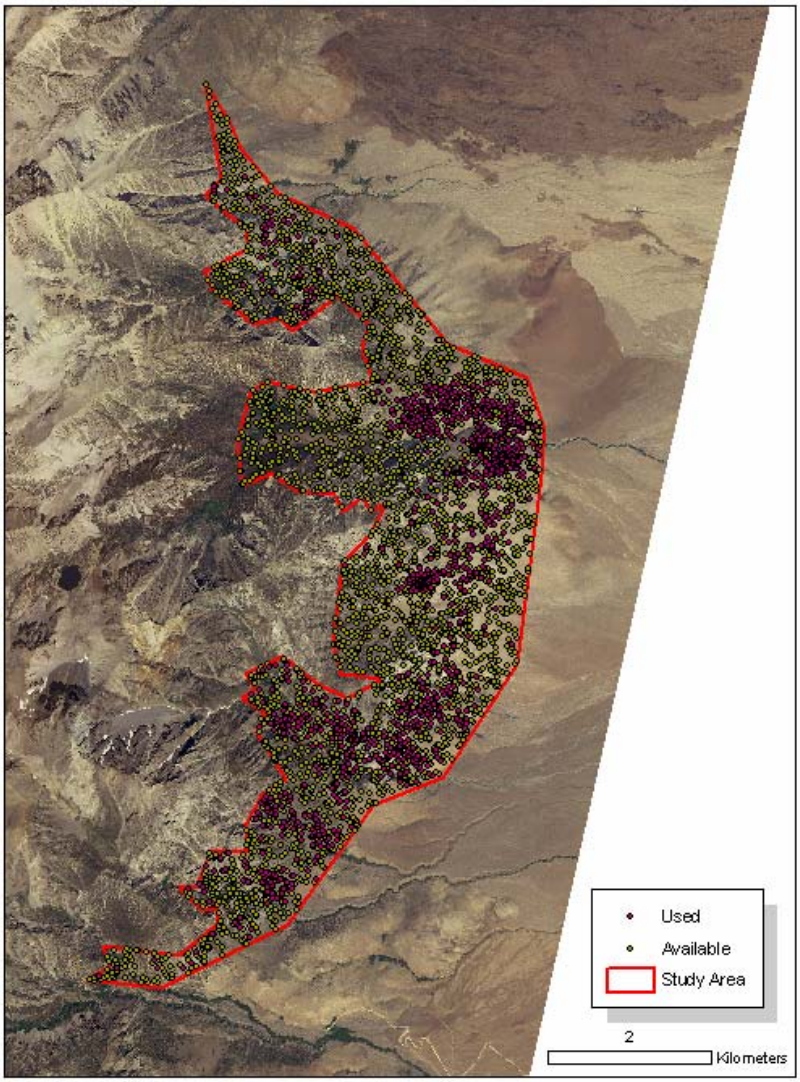

Figure 2: Mt. Baxter and Sawmill Canyon winter ranges with points that identify bighorn use sites (1333) and additional sites (3398) that were randomly generated within the study area. This data was used to analyze use versus availability of habitats.

Biomass Estimation

To determine bighorn winter forage quality and quantity, 51 sites were sampled in the winter and spring of 2008. An additional 18 sites will be added, so a total of 69 sites will be sampled in 2009. Sites were selected to represent the variation of slope, aspect, elevation and land cover that occurs in the study area and were divided between burned and unburned sites. Initially the NLCD land cover classification (herbaceous, shrub and forest) was used to stratify sampling because of its extensive coverage and small cell size (30m pixels). Each site was sampled three times throughout the growing season and biomass of grasses and forbs was estimated with a non-destructive double-sampling technique (Bonham 1989). Biomass peaked in April at sites < 2000m and in May at sites > 2000m. This analysis uses the peak biomass from each site, across all rounds.

Bighorn Habitat Selection

One simple method to determine selection for particular habitat attributes is to calculate the ratio of used to available. Attributes with a value greater than 1 are selected and those with values less than 1 are avoided. The used locations in this analysis include no more than two locations per day from an individual and are limited to lower elevation winter range (<2500m). Due to the limited number of collared bighorn in 2008 in this area, used locations are strongly influenced by a few individuals but the patterns are likely representative. Available habitat attributes were described by 3398 random points

placed within a polygon delineated by altitudinal boundaries (1500m-2500m; Figure 2). All categories with ≤ 5 used points were removed from analysis.

Results

We compared biomass variance and selection across different land cover classifications (NLCD and the three developed from CALVEG). Biomass variance was consistently higher in shrub categories.
The used/available data shows a trend of selection for barren and shrub categories and selection against forest, although there are some exceptions depending on the land cover classification. Selection for shrubs varies depending on the type of shrub and this may be caused by larger shrubs acting ecologically more like a forest by limiting visibility. Lumping large shrubs with lower stature shrubs decreases overall selection for the general shrub category. When shrub categories are further subdivided, selection increases for smaller stature shrub categories, such as sagebrush. Ideally we want a simple land cover classification, but the differential selection for shrub categories implies that combining all shrubs into one cover type is not adequate. Considering the biomass variance and selection differences, we developed a classification based on the most biologically important land cover types for bighorn by reclassifying the CALVEG dominate map into four categories: barren, forest, shrub forest and shrub.

This preliminary analysis indicates that selection on winter ranges is not being driven by green biomass alone. The strongest selection is for barren land cover which tends to have intermediate levels of biomass, followed by selection for shrub and then avoidance of shrub forest and the strongest avoidance of forested land cover (Figure 3). If bighorn were selecting on the basis of green biomass alone, the strongest selection should be for shrub land cover. Barren land cover type tends to correlate with steep rocky escape terrain which bighorn use to avoid predation. This selection for intermediate biomass may represent the tradeoff bighorn are making to avoid predation.

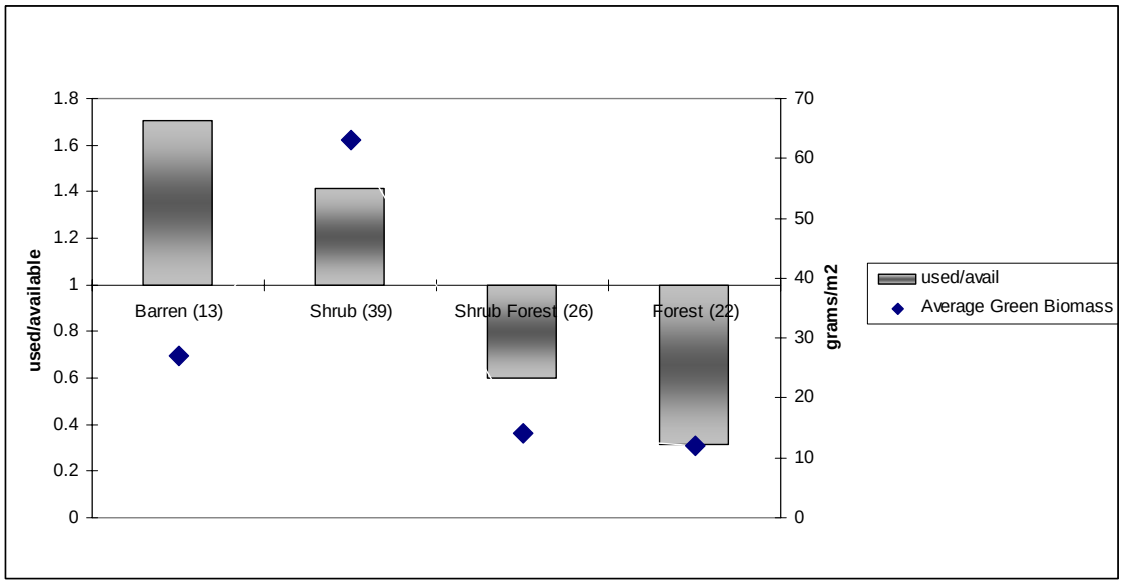

Figure 3: Bighorn Selection for Land Cover Class and Green Forage Biomass. The number in parentheses is the percentage of each land cover in the study area. Use > 1 indicates selection for Land Cover Class.

Despite the strong selection for barren land cover, it may be an incorrect oversimplification to assume that barren is the best foraging habitat for bighorn. It may be helpful to separate out different behavioral states (foraging, moving and bedding) associated with habitat use. We are currently determining if the behavioral states can be detected using small time scale location data and correlating that with ground observations. In addition, we plan to integrate a measure of forage quality with various habitat types.

PERSONNEL AND ACKNOWLEDGEMENTS

Personnel include Tom Stephenson, Ph.D., Becky Pierce, Ph.D., John Wehausen, Ph.D., Jeff Davis, Jeff Ostergard, Dave German, Dennis Jensen, Vicki Davis, Heather Johnson, Maya Leonard-Cahn, Lacey Greene, Mark Kiner, Kathleen Knox, Sarah Musselman, Jonathan Fusaro, Kelsey Ellis, Mike Dodd, Kevin Monteith, Joy Erlenbach and Katie Nelson, all of whom contributed to the preparation of this report or the collection of the data contained within it. Funding for the recovery effort is provided by the California Department of Fish and Game, the U. S. Fish and Wildlife Service (through Section 6 grants), the Bureau of Land Management (funded GPS collars) and the Sierra Nevada Bighorn Sheep Foundation (a registered nonprofit).

Recommended citation:

California Department of Fish and Game. 2008. 4th Quarter Report of the Sierra Nevada Bighorn Sheep Recovery Program; October-December. Bishop, CA.