

# SECOND QUARTER REPORT OF THE SIERRA NEVADA BIGHORN SHEEP RECOVERY PROGRAM



Photo by Art Lawrence

APRIL-JUNE 2008

## QUARTERLY REPORT (APRIL-JUNE 2008)

### **BIGHORN DEMOGRAPHY**

The survival rate for bighorn ewes that wore radio-collars during the 2<sup>nd</sup> quarter of 2008 was 96%. Ram survival during April - June 2008 was 96%. The recently completed population estimate for the previous year (2007/2008) indicates a population that continues to fluctuate around 400 total animals. Poorer survival than in previous years appears to be limiting population growth in some herds. Efforts to understand the factors hampering recruitment of lambs are underway, as well as attempts to limit mortality among adults. The reproductive base of adult and yearling females now numbers around 185. Sierra bighorn continue to occupy 8 of the 16 herd units. (See the attached annual monitoring report for more details.)

### **LAMBING ACTIVITY ON WHEELER RIDGE 2000-2008**

The use of radio collared telemetry and distinctive ear tags has permitted very precise monitoring of lambing activity of individual ewes on Wheeler Ridge during the last eight years. Additionally, careful observations have made it possible to observe lambing activity of the population as a whole and to compare this to the lambing activity of individually marked females.

During the eight year period we have observed a declining trend in all parameters studied. Total lambs born has decreased from 89% (total lamb/ewe ratio X 100) to 44% in 2008. The decrease in lamb/ewe ratios in collared animals is far less dramatic (approximately 80% early in the study period to approximately 70% in more recent years). Declines in lamb survival to yearlings was also observed during the study period with very dramatic losses occurring in 2007-2008. One year survival of lambs declined from 80%/74% (collared ewes/total ewes) in 2000-2001 to 25% (identical survival among collared and total ewes) in 2007-2008. Total recruitment (as measured by survival to 2 year-olds) has declined from a high of 65% (2001 lambs surveyed in 2003) to a low of 17% (2006 lambs surveyed in 2008)(Table 1).

QUARTERLY REPORT (APRIL-JUNE 2008)

**TABLE 1: Wheeler Crest Lambing Activity 2000-2008**

Year	Collared Sheep					All Sheep			
	Total Collars (Ewes)	Lambs Born	Lambs Surviving (1 <sup>st</sup> month)	Lambs Surviving (1 <sup>st</sup> year)		Total Ewes	Total Lambs Born	Total Lambs Surviving 1 <sup>st</sup> year	Total Lambs Surviving to 2 <sup>nd</sup> yr
2000	5	4 80%	4 80%	4? 80%	19	17 89%	(14?) 74%	10 53%	
2001	6	5 83%	5 83%	5? 83%	20	15 75%	(14?) 70%	13 65%	
2002	7	6 86%	5 83%	5? 83%	26	15 58%	13 50%	11 42%	
2003	9 (8)	6 67%	5 56%	5? 56%	27	16 59%	11 41%	13**(8) 48%(30%)	
2004	11 (10)	7 58%	7 58%	7? 58%	36	22 61%	13 36%	12 33%	
2005*	12	8 67%	8 67%	7? 57%	37	18 49%	12 32%	8 22%	
2006	15 (14)	11 73%	9 60%	9? 60%	36	17 47%	14 39%	6 17%	
2007	17 (16)	11 65%	9 53%	4 25%	36?	19 53%	9 25%		
2008	16	11 69%	10? 63%		36?	16 44%			

\*5 ewes removed ( translocated to Baxter)    \*\*questionable

**Lambing Activity of Collared Ewes**

Since ear tags permit individual identification it has been possible to precisely monitor lambing status of selected animals. Over the past 8 years a total of 24 ewes of reproductive age have been ear-tagged and collared on Wheeler Ridge. The number of tagged ewes in any year has steadily increased from a low of 5 (2000) to a high of 17 (2007). There are currently 16 ewes on Wheeler Ridge (2008).

Lambs born to collared ewes has varied from a high of 86% (2002) to a low of 58% (2004). In 2008, 69% of collared ewes had lambs. It has been observed that a number of lambs die during the first month of life. In 2006 and 2007, two lambs died each year during the first month. One lamb was lost in 2008. No attempt has been made to determine cause of death in most of these cases and lamb mortalities have not been recovered. Two notable exceptions occurred in 2002 and 2003. In June 2002, a ewe identified as S11 lost her lamb to apparent rockfall in upper Huarte Canyon. The carcass of the lamb was recovered and cause of death well established. Amazingly, the following year, June 2003, the same ewe and her lamb were both killed by rockfall in central Mayfield Canyon. Again, both the ewe and lamb were recovered and cause of death well established.

## QUARTERLY REPORT (APRIL-JUNE 2008)



Determining the survival of individually identified lambs to yearling can be problematic. It is well known that lambs may cease to associate with their mothers after the end of nursing. In certain instances, however, lambs will continue to associate with their mothers for considerably longer periods of time. If, during winter surveys, we observe a single ewe and lamb we have made the assumption that they are a mother-lamb pair (see photo). Likewise this would follow if we observe 3 ewes and 3

lambs. It is not known, at this time, if our assumptions are correct. Perhaps the utilization of fecal DNA identification of individuals can answer this question in the future. The survival of lambs to yearling has remained relatively high in most years. 2008 was a notable exception. The lambs of only 25% of collared ewes survived beyond the first year (Table 1). This is a dramatic departure from previous years where survival of lambs to yearling has been much greater. Interestingly, the data from total (collared and uncollared) sheep indicates that there has been a slow and steady decline in first year survival of lambs during the entire period (Table 1 and Figure 1).

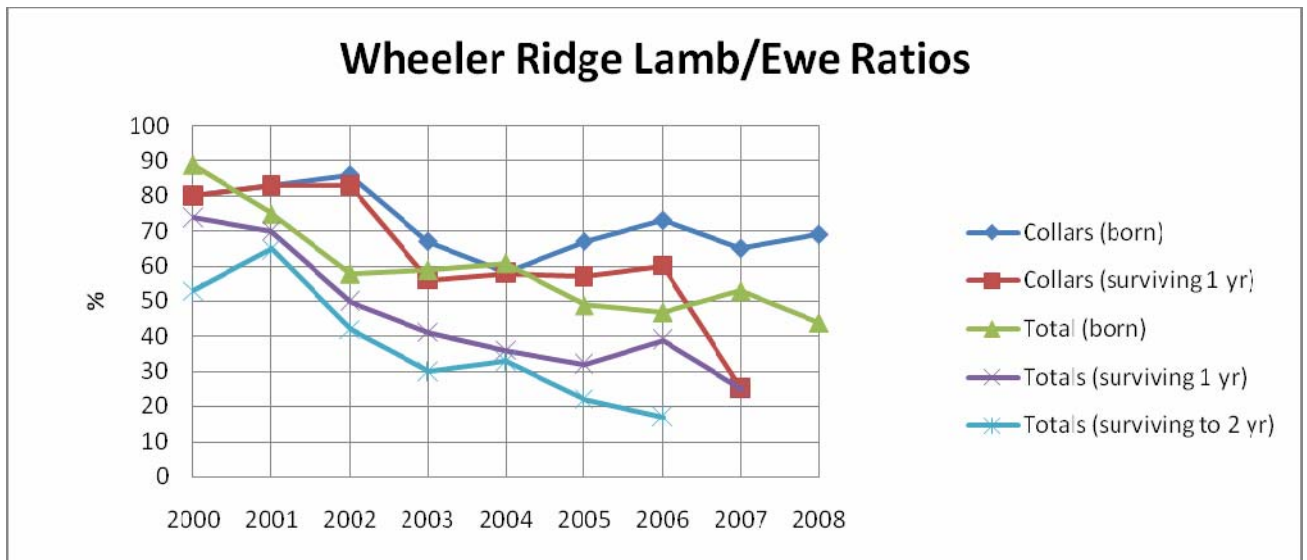


Figure 1. Lamb:ewe ratios in the Wheeler Ridge herd unit during 2000 – 2008. “Collars” indicates lambs born to radio-collared ewes, whereas “totals” refers to lambs born to all ewes in the population.

**DETECTING PREDATION BY MOUNTAIN LIONS**

In the past, locating lion kills often required days of manually tracking mountain lions and triangulating locations using VHF signals. Since the advent of GPS technology the identification of the locations in which mountain lions have killed large prey has become much easier. GPS collars allow predator monitoring and control personnel in the Sierra Nevada Bighorn Sheep Recovery Program to download accurate location data onto GIS maps (Figure 2) providing a picture of mountain lion movement. Because mountain lions almost always cache their prey and return to feed on it, simply looking for overlapping locations that are over a 2 day period, usually at night, gives program personnel areas of high probability to investigate when searching for lion kills. These location “clusters” indicate if the mountain lion is hunting in bighorn habitat and, if a bighorn sheep kill is found, the cluster data is used to identify which mountain lion was responsible. Within the Recovery Program, the use of a cluster algorithm has enhanced our ability to plot clusters by identifying them among all locations associated with each animal.

The cluster algorithm is a query based approach within the Program’s database. The algorithm identifies clusters based on user selected parameters, including time of day, cluster size (radius), and minimum number of points per cluster. The database produces a cluster location map (ARC GIS) and investigation data sheet based on the input parameters.

The cluster analysis is used by predator personnel as a starting point. The cluster locations are then plotted over all locations and the cougar’s movements are double checked so that no likely kill-site movements are missed. A map of likely kill locations is given to trained field personnel to investigate for evidence of a mountain lion kill.

Of the GPS collared mountain lions with home ranges that encompass bighorn sheep habitat, 92% of identified clusters landed in areas that were not in bighorn sheep habitat (Table 2).

	Non Bighorn Habitat 92%		Bighorn Habitat 8 %	
	Number of Clusters	Percentage of Clusters	Number of Clusters	Percentage of Clusters
Sheep	0	0%	12	57%
Deer	41	80%	3	14%
Elk	2	4%	0	0%
No Evidence	8	16%	6	29%
Total Investigated	51	19%	21	88%
Not Investigated	212	81%	3	12%

Table 2. Number of clustered investigated, in and out of bighorn habitat, and the species identified at each site.

This is not surprising because mountain lion home ranges in the eastern Sierra Nevada encompass the winter ranges of high density mule deer herds, and the diet of mountain lions in this region is primarily mule deer. Of the potential clusters that landed in bighorn



## QUARTERLY REPORT (APRIL-JUNE 2008)

sheep habitat 88% have been investigated of which 57% were bighorn sheep kills, 14% were mule deer, and 29% had no evidence of a kill. Because mountain lions will often return to favored resting places, we expect to have some proportion of clusters that were not actual kill site locations. In some instances it can be difficult to locate remains, however, even when mountain lions kill fawns or lambs there is often some evidence left behind. For this reason, a dog is often used by field personnel to assist with searches of clusters.

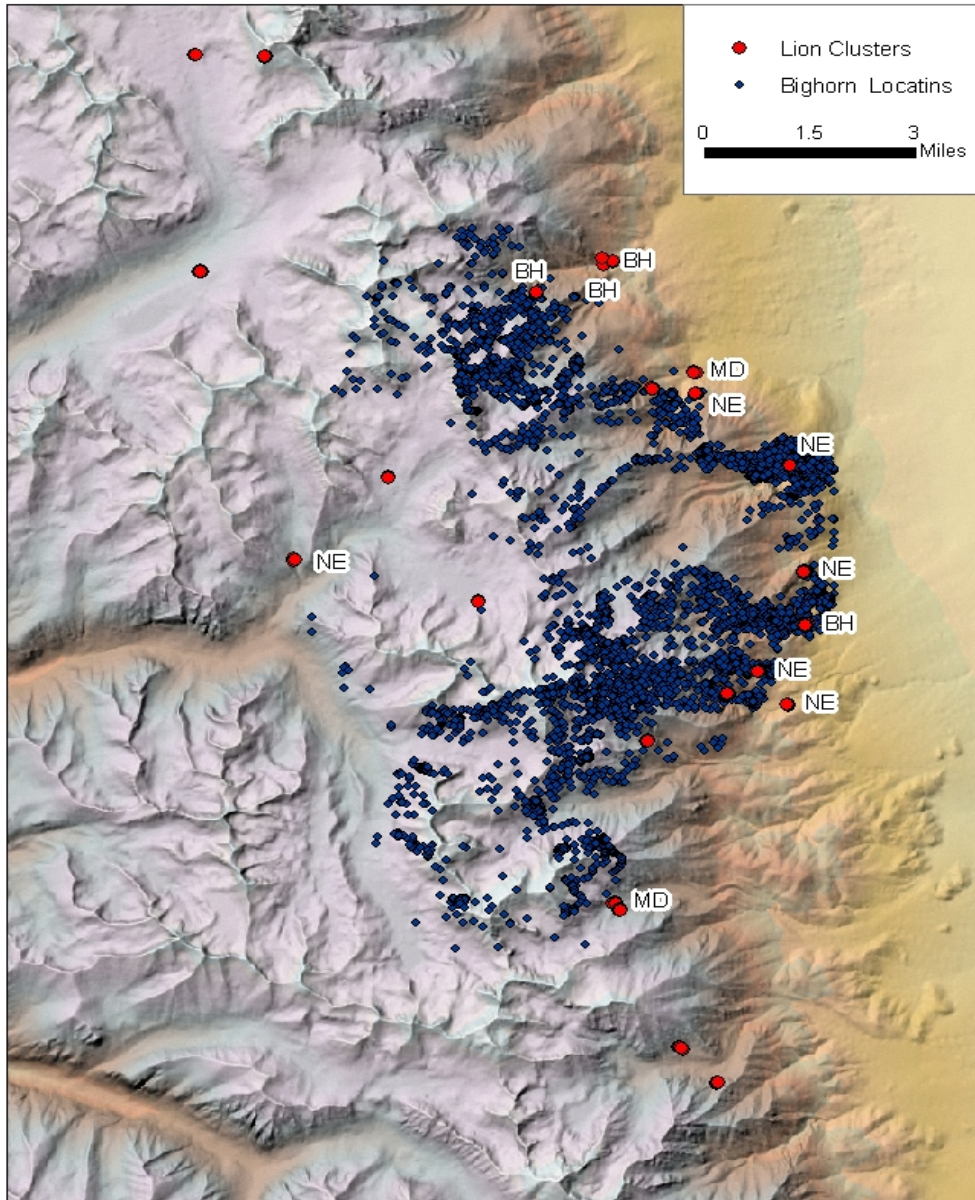


Figure 2. Representative Lion Clusters Identified for Investigation  
NE – No Evidence, MD – Mule Deer, BH - Bighorn

## QUARTERLY REPORT (APRIL-JUNE 2008)

### PERSONNEL AND ACKNOWLEDGEMENTS

Program 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, Sara Musselman, Jonathan Fusaro, Kelsey Ellis, and Joy Erlenbach, 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. 2<sup>nd</sup> Quarter Report of the Sierra Nevada Bighorn Sheep Recovery Program; April - June. Bishop, CA.