FOURTH QUARTER REPORT OF THE SIERRA NEVADA BIGHORN SHEEP RECOVERY PROGRAM

Photo by Art Lawrence

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

BIGHORN DEMOGRAPHY

The survival rate for ewes during the 4th quarter was 96%, while survival of radio-collared rams during October to December was 100%. The annual survival during 2007 was 87% and 90% for ewes and rams, respectively. Considering that 2007 was a drought year, adult survival during this year remained relatively high. Although survival monitoring routinely occurs during this fall period, surveys to estimate population size generally do not. Most bighorn sheep remain at high elevations during the fall and are less accessible as early snow storms arrive. Bighorn sheep typically move to lower elevations as snow accumulates in the high country. Winter surveys will occur on those low elevation (<8,000 feet) ranges as sheep use them; usually after the New Year.

THE CAPTURE OF SIERRA NEVADA BIGHORN: WHY IS IT NECESSARY?

To meet monitoring objectives outlined in the Draft Recovery Plan, Sierra bighorn need to be captured and radio-collared. Capture and collaring efforts are essential to track population trends, estimate survival and reproduction parameters, determine cause-specific mortality, identify habitat-use patterns, investigate population health and nutritional status, and collect genetic information. These monitoring efforts allow recovery program personnel to detect population declines and determine factors causing declines. This enables management to adaptively respond to factors limiting population growth and ensure the long-term persistence and recovery of the Sierra bighorn population. Furthermore, sound data on population size and trend are essential for planning and implementation of translocation efforts, an important tool for recovery.

The backbone of any endangered species monitoring program is developing a method to accurately track population status. The mark-resight sampling method is used to estimate the annual population size of Sierra bighorn sub-populations. Mark-resight requires that a portion of the population be captured and radio-collared and that those marked animals are distributed throughout the population. Ground crews then conduct repeated surveys of Sierra bighorn sub-populations, during both winter and summer months, systematically searching and identifying all marked and unmarked bighorn sheep to estimate population sizes with associated confidence intervals.

Radio-collared bighorn sheep also allow personnel to track the survival and reproductive success of individuals. Monthly aerial telemetry flights are conducted to monitor survival, and radio-collars emitting a mortality signal are located in the field and investigated. Cause-specific mortality is crucial for determining factors that may be limiting population growth, and has been particularly important for identifying Sierra bighorn herds subject to predation. Radio-collared bighorn sheep also facilitate the monitoring of Sierra bighorn lambing success. In ungulates, reproductive success is the vital rate that typically has the greatest impact on population increase and, thus, the monitoring of this parameter is essential for diagnosing lags in population growth.

Another benefit of Sierra bighorn captures is the deployment of several global positioning system (GPS) radio-collars that automatically collect and store thousands of locations. GPS collars are invaluable for tracking bighorn sheep movements, distribution, and habitat-use patterns, particularly in the difficult and rugged terrain of the Sierra Nevada. Furthermore, GPS data can be used to generate predictive models of habitat selection, classify movement corridors, prioritize ranges for translocations, and identify areas where natural range expansions are most likely to occur. Data obtained from GPS collars previously attached to Sierra bighorn have revealed critical information about bighorn movements into domestic sheep allotments, range expansions that were previously unknown, and patterns of elevation use in response to weather.

Finally, the capture of Sierra bighorn allows program personnel to monitor the overall health of the population, as individuals are sampled for disease vectors, parasite loads, genetic diversity, and nutritional condition**.** Such sampling can indicate possible disease issues, enabling personnel to investigate the importance of inbreeding depression in population performance, and understand how different habitat characteristics differentially contribute to bighorn health and body condition.

Bighorn sheep being transported to base station.

Processing team at the base station.

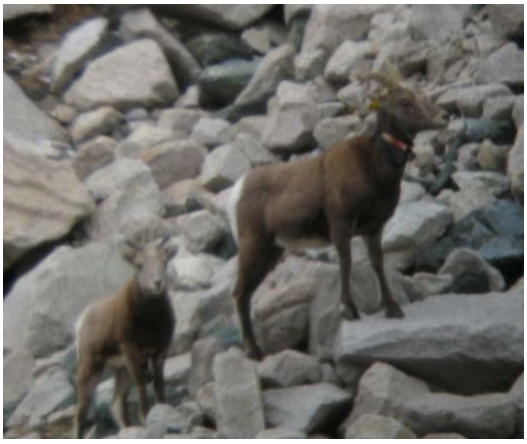
WHEELER RIDGE UPDATE

Weather conditions were relatively mild during the month of October and sheep remained on high elevation summer ranges for most of the month.

After the first significant snowstorm of the season on November 11 some sheep began a migration to lower elevation winter ranges. By the third week of November approximately 20 sheep (mixed ewe and ram groups) had descended to the vicinity of the Mill at the end of Pine Creek Road.

Following another major snowstorm on December 6, more sheep began movements to winter habitat. By the second week of December more than 45 sheep could be observed in roughly 4 different groups moving out of Pine Creek Canyon towards the steep, east-facing canyons of Wheeler Ridge. By the third week of December the migration was more or less complete. All sheep had left Pine Creek Canyon and could now be observed in the lower elevation canyons of Wheeler Ridge.

Not all sheep followed the migration just described. Several collared ewes descended directly from summit ridges to Mayfield and Hellcat Canyons. Others do not appear to have descended to winter habitat at all. One GPS-collared ewe has remained above 11,000 feet for the entire period.



A very preliminary survey yields a total of 33 ewes, 4 yearling ewes and 9 lambs. As 5 of the unobserved collared ewes had lambs during summer, the number of surviving lambs could be as high as 14. A total of 19 lambs were born in the Wheeler Ridge herd during the Spring of 2007. Two died within days and 15 are known to have survived to August. Results of winter surveys will be reported in the next quarterly report.

Rams were seen accompanying all ewe groups. By the end of December all collared rams could be located on the lower-elevation winter range of Wheeler Ridge and, while many were accompanying ewes, the majority could be observed in ram groups numbering from 4 to 10 animals. The total number of rams on Wheeler Ridge is above 50 animals.

SEASONAL MOVEMENT PATTERNS

Bighorn sheep follow seasonal movement patterns relative to environmental conditions, food and safety concerns. In the winter and early spring months, bighorn sheep typically occupy lower elevation ranges to optimize their nutrient intake and avoid deep snow. As the snow melts, bighorn sheep will move higher in elevation following vegetation green up. Male movements tend to increase in distance and vary more in elevation as the rut approaches in the fall; however, rams use a range of elevations to a greater extent throughout the year than do females. During the summer months the ram on Wheeler Ridge in Figure 1 occupied high elevations ranging between 9,000ft. and 12,000ft. In December he began to move to lower elevations and by the end of the month was occupying winter range at 8,000ft or lower. During November, the peak of the rutting season, he exhibited significant movement throughout the range in search of females.

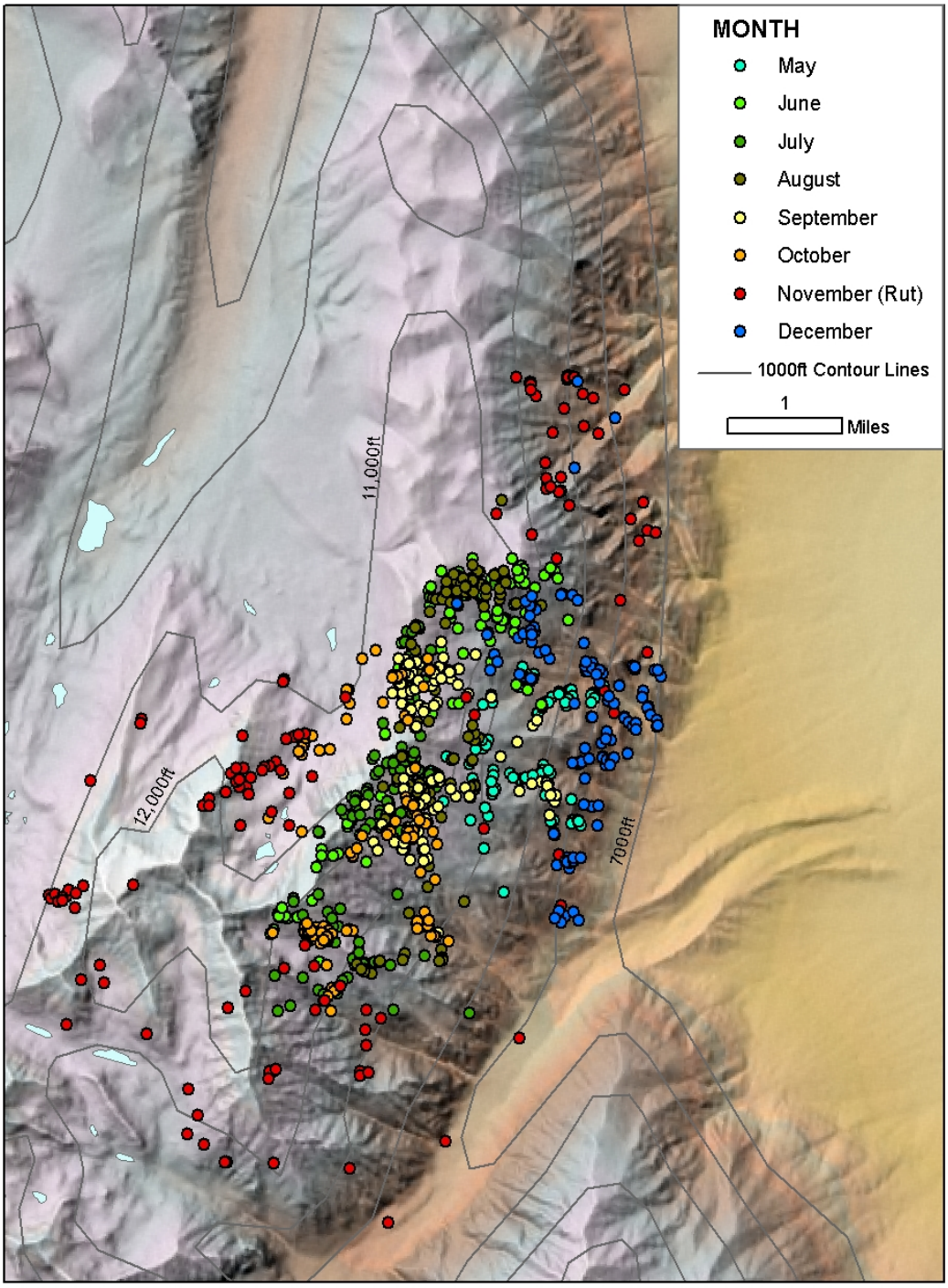


Figure 1. Movements of one ram as recorded by a GPS collar on Wheeler Ridge during May – December 2007.

REAL-TIME GPS COLLAR TECHNOLOGY

As soon as it became available in the 1960s, the profession of wildlife biology relied on conventional VHF telemetry when technology was employed to track the movements of wildlife. About a decade ago, GPS technology began to be incorporated into collars to enable the recording of locations in detail. The recovery program is continually trying to employ the latest in technology that will enhance the information acquired on bighorn sheep and improvements in collars provide a tremendous amount of information. The main function of GPS collars is to record the movements and habitat use of animals across the landscape. There are basically three types of collars available now. One type (store-on-board) stores the data on the collar and the collar has to be retrieved to get the data; either by dropping off of the animal or through the recapture of the animal. The second type (remotely downloadable) allows one to remotely download the data once the animal is within your line of sight using a special receiver. The latest type retrieves the data off of the collar via mobile phone networks and enables data recovery using the internet; location data may then be plotted readily in GIS software (Figure 2). The collars that permit phone downloads are the most advanced. Some mobile phone versions use cellular phones but the application of these is limited by the available phone coverage in the backcountry. The newest and most efficient versions use the satellite phone network. In October, we began deploying GPS collars that could be downloaded via the satellite phone network on Sierra bighorn sheep. To date the collars have worked well and have greatly improved the efficiency of data collection from those animals. In addition to providing daily locations via the internet, these collars also transmit information that can be used to confirm that an animal is alive.

Receiving data in real-time has valuable implications for many aspects of the recovery effort, including: (1) Instant notification of mortalities increases the likelihood that they may be investigated quickly to accurately identify the cause of death. (2) Real-time monitoring of movements, especially long distance movement by rams, has important implications for the identification of and response to forays into areas grazed by domestic sheep. (3) The acquisition of nutritional samples at feeding sites may be acquired efficiently after bighorn have departed from an area. Traditionally, animals had to be located by triangulation of VHF radio-collars; while possible, this is extremely difficult and time consuming in the rugged terrain of the Sierra Nevada. (4) Finally, animals may be more readily observed to determine lamb production as young are born in the spring.

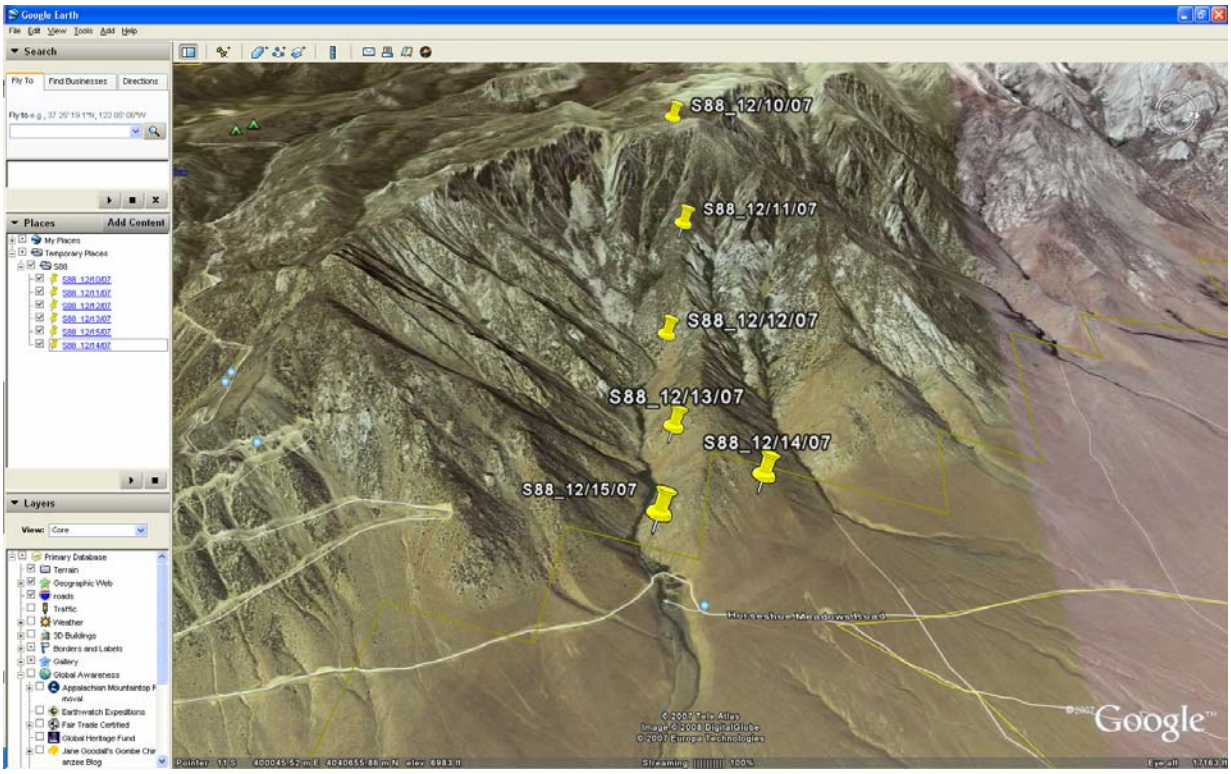


Figure 2. Locations of a bighorn ewe from the Mt. Langley herd during 10 – 15 December 2007 as she migrated to low elevation winter range. The data were transmitted through the satellite phone network in real-time, acquired via the internet, and plotted using a GIS.

PERSONNEL AND ACKNOWLEDGEMENTS

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