1994 MOUNT BAXTER BIGHORN HERD STATUS

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INTRODUCTION

Prior to the beginning of an extended drought beginning in 1987, the Mount Baxter bighorn population in the Sierra Nevada made extensive use of low elevation wintering areas in late winter and spring (Wehausen 1980). These winter concentrations of sheep allowed two important activities relative to their management. One was the development of reliable population counts representing the minimum sheep in the population. The second was trapping and transplanting of some of these sheep for reestablishment to historic ranges in the Sierra Nevada. Three such populations were reestablished between 1979 and 1988. Annual winter counts were used to monitor dynamics of the population. This was critical to determining when sheep removed for translocation had been replaced through recruitment, allowing further removals. Considerable mountain lion predation was documented on the winter range during the 1980's. Although it was recognized as competing with management needs for stock to reintroduce, predation losses were not considered at a level that would preclude reintroduction removals (Wehausen 1983).

The six consecutive years of drought that began in 1987 resulted in an unexpected abandonment of low elevation winter range use by this bighorn population. Instead they apparently remained at high elevations throughout winter and spring, where they have been found occasionally in that season. This shift in habitat use is presumed to have been a response to mountain lion predation, and facilitated by the consecutive years of winter drought. However, in lowering the risk of predation by remaining high in late winter and spring, these sheep have also substantially lowered their nutrient intake during that period of late gestation. The effects of this first became apparent in a temporal shift of the lambing season to about one month later than prior years (Wehausen 1991). With lambs born later and wintering at high elevations, lamb survival then dropped markedly. This raised considerable concern about whether lamb recruitment was sufficient to replace adult mortality. Increasing difficulty in finding ewes in summer has further emphasized this concern (Wehausen 1993).

This report summarizes information we collected on the Mount Baxter bighorn population during 1994. This information is presented in a long term context relative to data collected for the past two decades by the first author. Because lack of winter range use has prevented the tracking of actual population sizes since 1986, this summer we attempted to identify individual ewe groups to the extent possible to derive a minimum number of ewes present.

STUDY AREA AND METHODS

Although the Mount Baxter herd has been referred to as a single population for many years, winter range fidelity of naturally marked sheep and the lack of any apparent crossing of Sawmill Creek led to a tentative conclusion that two subpopulations of ewes were involved (Wehausen 1979). This notion was further supported by the finding of summer ranges largely north of Sawmill Canyon for a couple of ewes radio collared in the Sawmill Canyon winter range in 1986. Although there remains some uncertainty concerning the distinctness of high country ranges, especially in the Woods Lake Basin area, these have been treated as separate subpopulations for some years (Sierra Bighorn Sheep Interagency Group 1984), known as the Sand Mountain and Sawmill Canyon herds. Because the Sand Mountain wintering population was considerably larger than that in Sawmill Canyon, and the source of most reintroduction stock, it has been the target of most data collection for a number of the years. Also, much of the northern portion of the summer range of the Sawmill Canyon population was not included in earlier data collection, rendering an incomplete data set for that herd. Our efforts this summer were again concentrated on the Sand Mountain herd. This means that we limited our work to the region from Mt. Baxter to Onion Valley. Because it is known that the Sawmill population uses the south side of the Woods Lake Basin, the region directly west of Mount Baxter has been an area of uncertainty and suspected to be an overlap zone. In past years, the region of the Guth Lakes immediately north of Baxter Canyon was used extensively by ewe groups that also used the Baxter Pass region and were presumed to be part of the Sand Mountain population. Therefore, summer sampling from that area was included as part of the Sand Mountain population sampling. However, with the apparent recent decline of the Sand Mountain population, there has been no evidence that it continues to use that region. This is an important question relative to the interpretation and use of one sighting above the Guth Lakes this summer.

We expended 38 person days from late June through mid August in the region between Mount Baxter and Onion Valley, concentrating entirely on areas used by females. This effort consisted of four day-hikes at the south end of the range and four multi-day trips. To keep the analysis of sighting rates consistent with previous years, we treated day hikes and beginning and ending days of multi-day trips as half days in our calculation of yield per unit effort, whereas other days were treated as entire days. We treated each of us as independent days only when we worked separately. This resulted in a total of 19.5 days of survey effort. During the course of this work we reached the summits of various peaks 7 times and crossed Baxter Pass on 9 different days. In addition, the winter range from Black Canyon to Sawmill Canyon was checked for sheep on 15 days between 6 February and 20 April.

We attempted to photograph ewe groups when possible as an aid to individual identification. We also described each group in as

much detail as possible, including natural markings, color differences of ewes and lambs and size differences of lambs.

RESULTS

The winter of 1994 was extremely mild both in precipitation and temperature. Winter range use for the Sand Mountain population was the lowest recorded to date, with no sheep observed in that range (Fig. 1). Five sheep (3 adult and 2 yearling ewes) were observed in the Sawmill winter range for a 3-day period, and a single ewe on two other occasions. Mountain lion tracks were much in evidence, as usual. In addition, one ewe was sighted at long distance at 12,000 ft. elevation on Kearsarge Peak. This lack of winter range use precluded any possibility of radio collaring ewes, as hoped for.

In the summer range, sighting rates of ewes were the lowest recorded to date, following a notable declining trend since 1991 (Fig. 2). The increasing trend in this sighting rate prior to 1990 does not necessarily represent increasing ewe density. Instead, it probably represents increasing hiking effort per day to develop an adequate sample of ewes as they became more scarce. By 1991, it was necessary to increase the allocation days to develop an adequate sample. This allocation has increased ever since (Fig. 2).

Our summer effort logged a total sample of 31 ewes, 6 yearlings, 18 lambs, and 11 rams. One noteworthy observation was a group of 6 rams of varying ages on Baxter Pass, where no ram group has been recorded before in this season. Of this total sampling, 9 ewes, 3 lambs, and 2 young rams were seen in a single group on the plateau immediately west of Acrodectes Peak above Guth Lakes. Because of the lack of use of this area by the Sand Mountain subpopulation in recent years, this group is believed to be part of the Sawmill Canyon subpopulation summering around the Woods Lake Basin. There were additional reasons to consider them different. Most of the ewes in the group were well ahead of the sheep further south in their pelage molt, and the lamb:ewe and yearling:ewe ratio were much lower than recorded further south. Consequently, we did not include this group in our analysis of minimum size and age composition of what we considered the Sand Mountain subpopulation. However, this group is included in the observation rates plotted in Figure 2 because of the inclusion of sampling from this area in previous years. The remaining sample of ewes, yearlings, and lambs was obtained entirely south of Oak Creek, despite much effort to find sheep in the vicinity of Baxter Pass and Mount Baxter.

The age composition of sheep sampled in the southern portion of the range indicated high survivorship of 1993 lambs (33 yearlings:100 ewes), and a high lambing rate (83 lambs:100 adult ewes). The 1993 lamb crop is the first since 1987 to have a yearling recruitment ratio similar to the lamb:ewe ratio the previous year. (Fig. 3). This probably reflects the very mild past

winter. This summer's yearling:ewe ratio exceeded the lamb:ewe ratio from last year. While this may reflect sampling error, it may also be a real difference resulting from a higher mortality rate of adult ewes than last year's lambs. This is consistent with the further decline in ewes seen per day (Fig. 2), despite the addition of yearling ewes into the population. Unfortunately, last year's lamb crop was the lowest ever recorded for this population (Fig. 3), thus the high lamb survivorship did not add many sheep to the population.

Two ewe groups were clearly recognized when seen a second time. It is probable that one of these groups was the first group seen this year on 30 June, in which case it was seen three times. Because of some uncertainty about the distinctness of this first group, we will derive two minimum population figures. When that first group is treated as the same one seen twice more, the minimum number of sheep we can account for in our sampling is 8 ewes, 1 yearling ewe, 2 yearling rams, and 7 lambs. If that first group is treated as different, our minimum increases to 12 ewes, 2 yearling ewes, 2 yearling rams, and 10 lambs.

Although we saw no sheep north of Oak Creek, we found definitive sign of a small number of ewes and lambs on Mount Baxter on two occasions, one of which was clearly 2 ewes and 2 lambs. A hiker told us of seeing a group of 2 ewes on Baxter Pass, which would suggest at least 4 ewes and 2 lambs in that region. Such a small number is consistent with the paucity of sheep sign we found in that area including the traditional mineral lick on Baxter Pass, as well as the very low utilization of flower heads of Hulsea algida and Polemonium eximeum on the summit of Mount Baxter, which has been a favorite feeding area. Adding these probable unrecorded animals to the two minima above would raise them to 12 or 18 total ewes, respectively.

The repeat sightings of known groups, and the limited amount of sheep sign in our study area is consistent with such a small number of ewes persisting. In 1992, a similar sampling occurred in which no ewes could be found north of Oak Creek, and ewe groups were resighted repeatedly, resulting in only 12 different total ewes accounted for. With the apparent population decline since 1992 (Fig. 2), our more conservative minimum of 9 total ewes is consistent with this 1992 minimum number south of Oak Creek. If these are added to the 9 ewes seen west of Acrodectes Peak and the 4 ewes believed to be present in the Mount Baxter area, a minimum of 22 ewes can be postulated for this larger region. However, this study did not make any attempt to establish a minimum number of ewes in the Sawmill Canyon subpoulation. Nor did we survey traditional ram habitat.

DISCUSSION AND RECOMMENDATIONS

The declining density of ewes in the Sand Mountain herd has brought about a steady decline in summer sampling efficiency. This low efficiency is rapidly approaching the point where the effort

necessary to develop a minimum sample is prohibitive. Even with a second observer and more total days allocated this summer, the sample size was minimal. To develop a more reliable empirical population estimate, two problems need to be overcome. First is the need for either collared ewes or higher resolution observations that allow reliable recognition of individual sheep to allow mark-and-sample estimation procedures to be used. The current sampling method will not consistently allow reliable individual recognition due to the very rugged nature of this high altitude range, where many sightings will be limited to long distances due to the high mobility of these sheep and the habitat they chose. The second need is for much greater sample sizes essential for reasonable resolution of mark-and sample estimates. Collaring opportunities appear remote, unless this population reoccupies its former winter range. Even if collaring were possible, the second problem above would stand in the way of good population estimates, due to the need to develop a large random sample of the population. We propose an alternative approach using recently-developed remote video technology currently successfully in use in desert regions by the senior author for similar estimation. These video units are triggered by remote infrared sensors. Critical to the success of this technology are well defined geographically small locations that sheep predictably use, such as trails and passes. We have identified a number of these in the summer range of this population. If we had such cameras operating this summer, our sampling would have been many times what we obtained, and with much greater resolution. Once these cameras are situated early in the summer, this would allow us to expand our efforts to additional areas, especially that occupied by the Sawmill Canyon herd, about which little is currently known. We anticipate a need for 8 such camera units to accomplish this and plan to pursue the necessary funding. While this will require a high initial cost, it will more than pay for itself over time in terms of data collection efficiency and data quality.

The decline of this population as a result of winter range abandonment raises important questions about what constitutes good bighorn habitat in the Sierra Nevada. All bighorn populations in this mountain range appear to have been wintering primarily in alpine habitats in recent years. However, not all have declined as a result. The Lee Vining Canyon population has prospered under such a pattern of high elevation winter habitat preference (Chow 1991, Chang 1993a,b). A portion of this population descends in April and May to elevations as low as about 7500 ft. to feed on new forage growth. Nevertheless, this still contrasts with previous winter range use by Mount Baxter herd ewes, which had already left their much lower elevation winter ranges by early April. For the past two decades, the Sand Mountain and Sawmill winter ranges have served as our model of prime bighorn habitat in the Sierra Nevada. Low elevation winter range has been considered the most limited component of bighorn habitat. Consequently low elevation winter range has been the primary criterion in choosing reintroduction sites. In contrast, summer alpine habitat has been considered relatively unlimited. With the recent shift to wintering in alpine

habitats, there is a need to reevaluate what constitutes good overall habitat. In particular, there is a need to better understand what constitutes good high elevation winter habitat. This will require winter bighorn ecology studies, and winter aerial analyses of high elevation habitats throughout the Sierra Nevada.

With the apparent decline of the Sand Mountain population and its lack of winter range use, the only past source of reintroduction stock in the Sierra Nevada has disappeared for the foreseeable future. This has brought the overall reintroduction program for Sierra Nevada sheep to a halt. The most immediate way out of this dilemma will be to use the Lee Vining Canyon population as future reintroduction stock once it exceeds 100 sheep. This places great importance on obtaining accurate census data for the Lee Vining population every year. Plans should also be put into place to make use of that population as reintroduction stock as soon as the opportunity arises.

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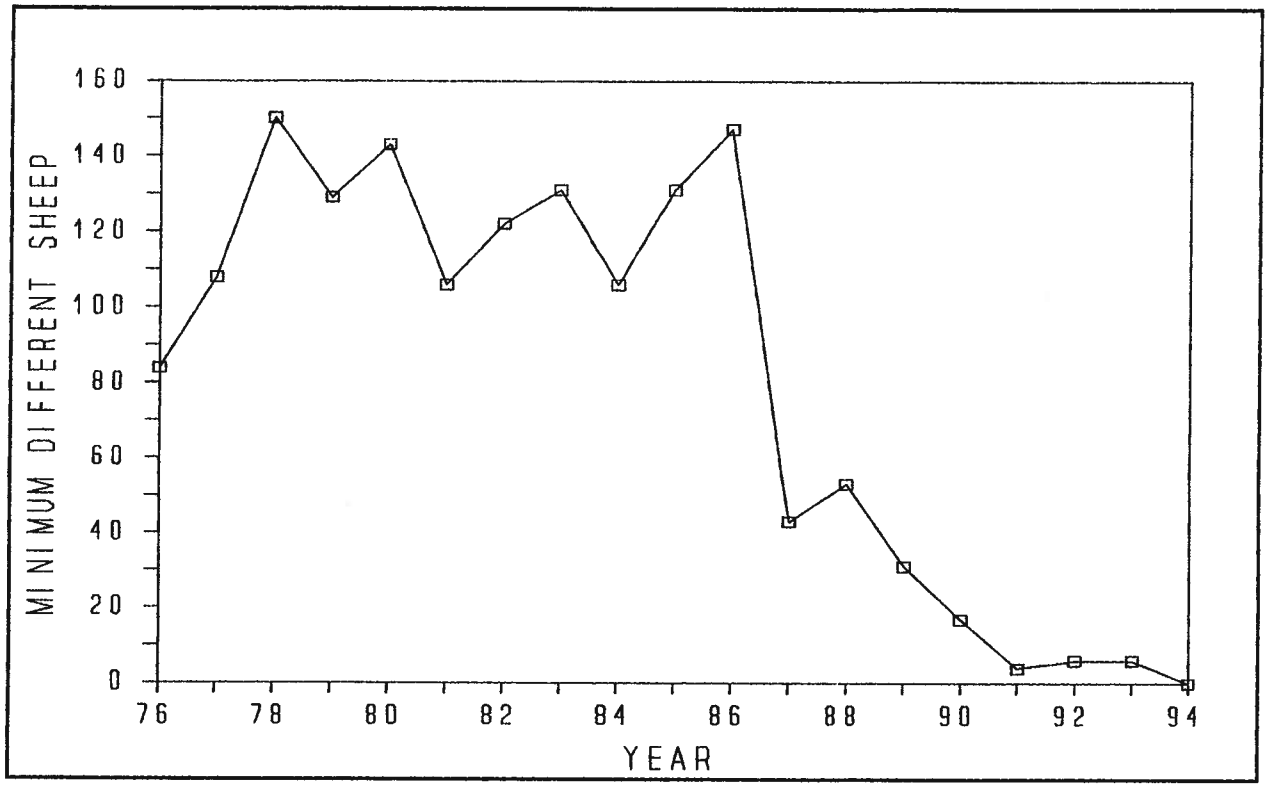

Figure 1. Minimum number of different mountain sheep accounted for on the Sand Mountain winter range, 1976-1994.

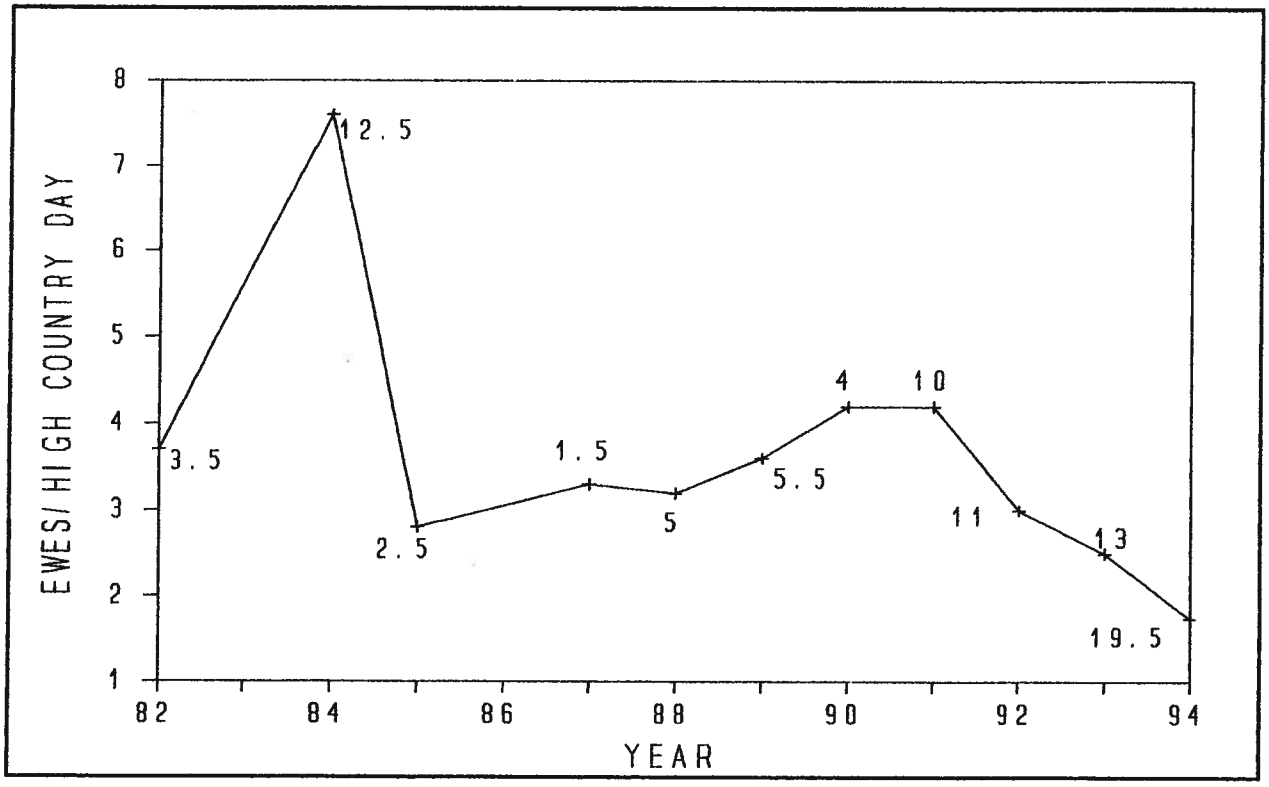

Figure 2. Average number of ewes seen per day in alpine habitats, June-September, 1982-94. Sample sizes are adjacent to data points.

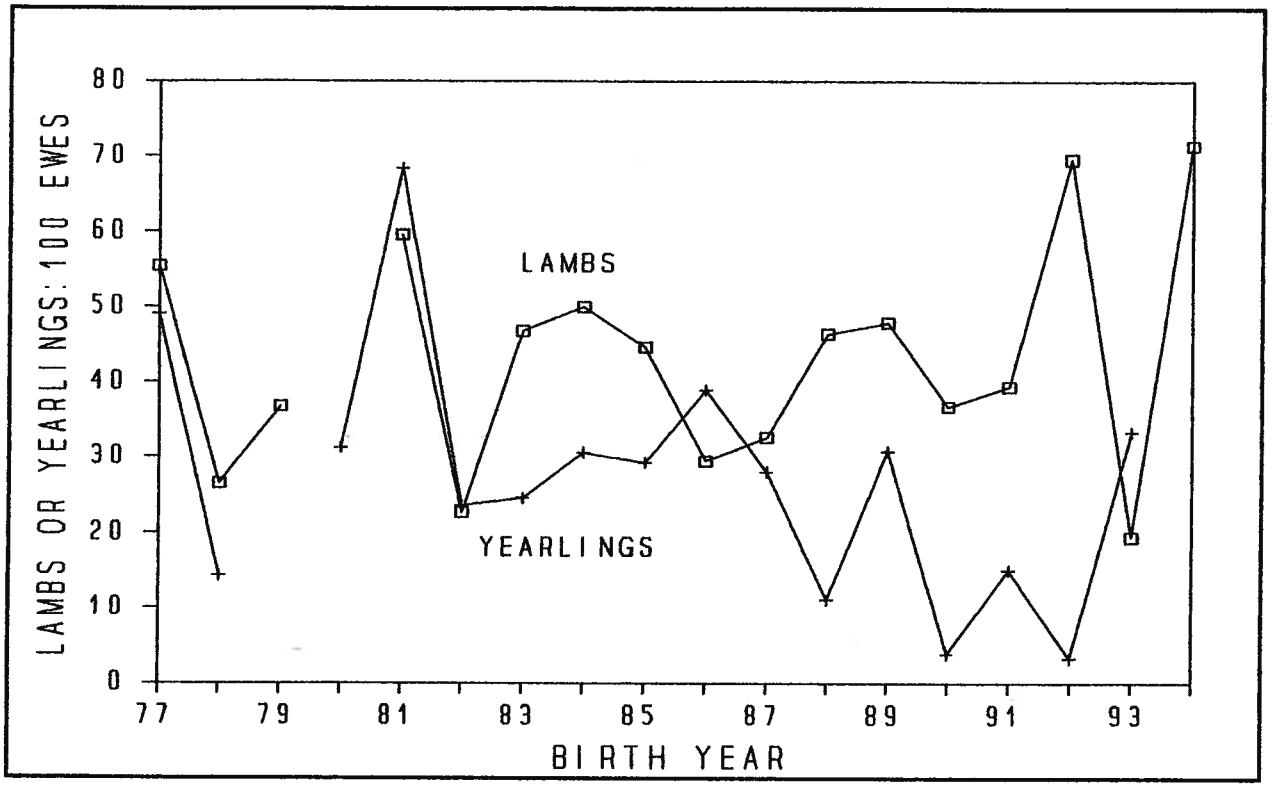

Figure 3. Summer lamb production and yearling recruitment ratios for the Sand Mountain subpopulation, 1977-94, plotted by birth year.