



1995 STATUS OF THREE BIGHORN SHEEP POPULATIONS
IN THE SIERRA NEVADA

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Despite successful reestablishment of three bighorn sheep populations in the Sierra Nevada between 1979 and 1988 to augment the two surviving native populations, this species has been losing ground in that mountain range in recent years. During a meeting of the Sierra Nevada Bighorn Sheep Interagency Advisory Group in January of 1995, it was decided that, because of considerable change in the status and problems of these sheep, the Recovery and Conservation Plan written for them in 1984 needed to be replaced with a new conservation plan. Because of the need for this new plan to be based on current information on population status, the authors of this report committed to updating information on the status of all five populations in the Sierra Nevada during the summers of 1995 and 1996. The choice of summer for these surveys is dictated by the lack of use of low elevation winter ranges by bighorn throughout the Sierra Nevada in recent years.

These efforts also allow an assessment of the effects of the particularly severe and long winter that occurred in 1995. While it was not the winter with highest recorded precipitation, this past winter has been reported as having the highest late spring snow pack this century due to a particularly cold and stormy spring. For a number of years, bighorn sheep throughout the Sierra Nevada have been wintering largely at high elevation sites that are substantially cleared of snow by wind, where they can avoid mountain lions. During this past winter, particularly wet storms beginning in March covered these high areas with thick snow. Some sites that are normally snow free most of the winter did not show open ground until June this year; yet, sheep did not appear on some lower elevation winter ranges used extensively in earlier years. Consequently, there has been considerable concern about winter survivorship. This report summarizes findings for the northern three populations investigated during 1995, and includes brief summaries of findings from winter. The remaining two populations will be investigated during 1996.

Lee Vining Canyon Population

Following early storms, a small number of sheep was recorded low in Lee Vining Canyon in early January, comprised of 3 ewes, 2 lambs, and 2 rams. One of the lambs was killed by a bobcat within a week of their appearance. We put out alfalfa to bait the remaining sheep for capture and radio collaring. However, by the end of January only 2 ewes remained in the lower canyon. We used a drop net to catch and collar them on 18 February. An additional 3 ewes were observed higher in the canyon in early February, but they did not eat alfalfa placed for them, and moved to unknown higher elevations instead. The two collared ewes remained in Lee Vining Canyon the entire winter, but no other ewes appeared on their usual spring range until mid May, when 4 additional ewes were observed in very poor condition. This appearance of ewes in the canyon was about 6 weeks later than in past years. The last remaining collared ram from the reintroductions also spent part of the winter in Lee Vining Canyon, and died

there in late March.

Dissatisfaction with the results of the 1994 summer census of the Lee Vining bighorn herd by inexperienced individuals led to a decision by the Sierra Nevada Bighorn Sheep Interagency Advisory Group to pursue a new approach this past summer. This entailed intense census efforts over short time periods using individuals with a high level of experience with bighorn sheep, especially in the Sierra Nevada. The first such effort took place in the last week of June, because of highly successful efforts by the second author two years ago at this time when large nursery group aggregations were found. It is also a time when almost all lambing has been completed. Participants in this census were: Don Banta, Les Chow, John Ellsworth, Noah Hamm, Lisa Hammett, Peggy Moore, Bill Perry, Ester Rubin, Steve Thompson, Carolyn Tiernan, Steve Torres, Elizabeth Wenk, and the two authors.

We met about 4PM on 26 June at the Lee Vining ranger station and developed a census strategy. That evening we looked for sheep from the floor of Lee Vining Canyon. On June 27 we broke into four groups -- one on Tioga Crest and three covering the Mount Warren crest from Lee Vining Peak to Gilcrest Peak. Two of these groups ascended the south end of Warren crest together, one of which worked the Lee Vining Peak area while the other headed to Mount Warren. The third group walked up Warren Fork to the divide above Lake Canyon, then ascended the crest and met the second group on the summit of Mount Warren. From there, one group descended to Lundy Canyon via Deer Creek, while one returned via Warren Fork. On June 28, another group walked out Tioga Crest to the ridge north above Dore Pass, while (1) a second group covered the Tioga Peak area, (2) a third group climbed up the south side of Lee Vining Canyon to spend the day studying the lambing rocks east of Warren Fork through spotting scopes, and (3) a fourth group climbed into these cliffs somewhat. On June 29, three groups looked for sheep from Lundy Canyon, attempting to glass slopes from as many vantage points as possible. On June 30, one group climbed Bloody Canyon to Mono Pass to look for the small population there. There was regular radio contact between groups on June 27-29, and two of the radios were also telemetry receivers that could be used to help find the two ewes with radio collars.

On June 26, a group of 2 ewes and 2 lambs was seen in the lambing rocks east of Warren Fork, and another group of at least 5 ewes and a lamb, including the two radio collars, was seen high near the eastern edge of this cliff region. On June 27, 6 sheep groups were recorded: (1) the group with the radio collars located from above on the ridge south of Lee Vining Peak and found to contain 7 ewes and 1 lamb; (2) a 2-yr old ram in the saddle south of Lee Vining Peak; (3) 1 unclassified sheep east of Mount Warren; (4) 2 (probable) ewes and 1 3-4 yr. old ram on the Gilcrest plateau that dropped into Lake Canyon; (5) 2 mature rams on the east ridge above Deer Creek; and (6) 9 rams ranging in age from 3 to 7+ on the east side of Warren Fork. On June 28, four groups were recorded in Lee Vining Canyon: (1) 2 ewes and 2 lambs in the lambing rocks; (2) 3 ewes including 2 radio collars in the same location as their group the previous day; (3) 1 ewe and 1 lamb dropping into the lambing rocks from the area of the large June 27 group; and (4) 3 ewes dropping into these rocks later in the same location. These groups added up to the exact numbers and composition known from this area the previous two days, thus added no new sheep. One ram was recorded on the plateau of Mount Scowden at the north end of Tioga Crest that was not seen the previous day. On June 29, the only sheep observed from Lundy Canyon was the ram on Mount Scowden seen the previous day. No sheep were observed in Bloody Canyon

on June 30, but recent sign verified the persistence of sheep there, including tracks in snow of a single sheep from the previous day.

These observations accounted for 11 ewes, 3 lambs (all born since about the beginning of June), 14 rams, and 1 unclassified, for a total of 29 sheep in the Lee Vining Canyon population. There were reasons to suspect some missed sheep on Mount Scowden. Three sets of tracks were seen crossing a snow bank below Mount Scowden in Lake Canyon, and two sets of tracks were seen in snow just below the Mount Scowden summit plateau on the north side. Also, Karl Chang observed a yearling ram and 2 2-yr old rams above Ellery Lake on Tioga Peak a week earlier that were not seen in that area, although we recorded 1 2-yr old ram near Lee Vining Peak. Nevertheless, we considered it unlikely that more than about a half dozen sheep were missed between Lee Vining and Lundy Canyons.

Because of the possibility of these missed sheep, we met Les Chow and Peggy Moore on 15 August to resurvey the area between Lee Vining and Lundy Canyons over a three day period. We documented the same composition of 11 ewes and 3 lambs in the Mount Warren region. In addition, we found 3 ewes and a lamb born in early July on Mt. Scowden. These sheep were undoubtedly the source of the tracks seen there in late June. This brought the total for the Lee Vining Canyon population to 14 ewes, 4 lambs, 14 rams, and one unidentified (33 total).

On 24 August, Les Chow and Peggy Moore looked for the small Bloody Canyon population and found 2 ewes, 1 lamb, and 3 rams on Mt. Gibbs. In late October, we repeated that survey following the discovery of 23 domestic sheep grazing on Mount Dana within Yosemite National Park, and found 1 ewe, 1 lamb, 1 yearling ram, and 3 rams. Given that Les and Peggy classified their group at close range, it is possible that the yearling ram is an additional sheep, rather than one previously misclassified as a ewe.

It remains to be determined what happened to the many sheep missing from the Lee Vining population. No carcasses were encountered during census efforts, thus it is not known where they might have died. Emigration is doubtful, but remains a remote possibility. When a few sheep finally descended to Lee Vining Canyon in late spring, they were in very poor physical condition. It seems noteworthy that so few sheep appear to have survived on Tioga Crest, where snow depths were clearly heavier than on the Mount Warren system, judging from snow remaining in early summer.

In 1993, the Lee Vining population census totaled at least 77 sheep, and possibly as many as 86, including 34-39 ewes (Chang 1993). The current population represents a decline of about 60%, and is close to what existed in 1988 after the initial faltering reintroduction was supplemented with 11 sheep from the Mount Baxter population. The population grew after 1988 only because of control of mountain lions in the area for 3 winters (Chow 1991). The loss of 60% of this population is devastating, especially in light of our prior hope that it might soon become a source of reintroduction stock, which the Mount Baxter population no longer provides. On the other hand, that 40% of the Lee Vining sheep and probably all those in Bloody Canyon survived such a severe winter is positive sign regarding the suitability of habitat in that region. This is particularly true given that most of these sheep wintered up high. If a metapopulation of interacting subpopulations can be developed in this region, it is likely to have long term viability. Currently, such viability is far less certain.

Given the recent status of the Mount Baxter population, the Lee Vining Canyon population remains an important potential source of reintroduction stock if it can increase as it did subsequent to 1988. Any future reintroduction program within the Sierra Nevada may be dependent on such an increase; thus, the Lee Vining Canyon population remains very important for the conservation of Sierra Nevada bighorn in general. The apparent losses from this winter may be a phenomenon to be expected periodically. We had previously set 100 sheep as the minimum number before removals for reintroduction would be commenced. It would be wise to consider reducing that number substantially in the future.

This population needs continued high resolution monitoring on an annual basis. All involved felt that the group census approach used this summer was very successful and much more efficient than previous approaches. In future years, it is probable that 4 individuals with much experience can develop a good count of the Lee Vining Canyon population in a couple 3-day surveys at ideal times. The Bloody Canyon population will require an additional few days for one or 2 individuals.

Wheeler Ridge Population

On 6 January 1995, following a major snow storm, we recorded 19 sheep on their favored slope by the mine in Pine Creek, composed of 9 ewes, 6 lambs, 1 yearling ram, and 3 older rams of varying ages. Steve Yaeger (pers. comm.) counted 20 the following day, but the sex and age class of the additional sheep is not known. Sheep used this slope regularly, disappearing up slope during storms and reappearing during better weather; however, the large number counted in early January never reappeared. In early March, this group had dropped to 7 ewes, 5 lambs, and the yearling ram, and by late March it had dropped further to 6 ewes, 4 lambs (3 female, 1 male), and the yearling ram, with the reappearance of a 2-year old ram. This basic group of ewes and 1994 lambs remained in this area until mid June. Three of the ewes bore lambs there; thus the late spring composition included 6 ewes, 3 yearling ewes, 3 lambs, and 1 yearling ram. Our summer surveys suggested that the ewes in this group may have been the only ones to survive the winter.

Three multiday attempts were made in August and September to count sheep from this population along the crest in the areas traditionally used in past years. These surveys turned up few sheep. We never located the group containing lambs from the mine area, although tracks and beds probably from them were found on two occasions. We located sheep only during our first trip in early August, totaling 4 groups and 5 sheep. These consisted of (1) 1 ewe; (2) 1 2-yr old ram and 1 ewe recognized from her horns as one from the spring mine group (presumably one that had no lamb), while the ram was likely the yearling from that winter group; (3) 1 medium sized (5-6 yr old) ram with dark pelage; and (4) a particularly large ram with lighter pelage. All sheep sign in the summer range suggested population decline -- much sign from past years and repeatedly none or little from this year.

We were able to verify one source of population decline in the long narrow canyon that rises from Scheelite in Pine Creek to the top of Wheeler Ridge. A single snow avalanche killed 12 sheep in this canyon during the winter. Their composition was 6 ewes (ages: 1,3,4,6,6,8), 1 lamb, and 5 rams (ages: 1,1,4,6,8). The ages of these dead sheep point to regular successful recruitment in recent years for this population. However, there are no indications that this

population has ever grown very large. The highest ewe count in this population was 13 (including 2 yearlings) in July 1991 by Rob Ramey and Laura Brown during a week of surveys along the crest (Wehausen 1991). Prior to that, the most accounted for was 12 different ewes (also incl. 2 yearlings) in the fall of 1986 by the same individuals in 24 days of survey (Ramey and Brown 1986). The addition of those killed in this winter's avalanche to those that survived by the mine yields 12 ewes. Whether more died elsewhere in avalanches is not known, but is not unlikely. No carcasses were found in the avalanche runout in the narrow canyon above the east end of the Pine Creek tailings pile. It is noteworthy that sheep were also documented to die in an avalanche in Pine Creek in their first winter after reintroduction (Andaloro and Ramey 1981). It is likely that such avalanche losses occur regularly in this steep canyon. In conjunction with mountain lion predation, these losses may be limiting population increase. A mountain lion killed a 13-year old ram in December 1995 at the southeastern base of Wheeler Ridge. This was probably the same large ram seen in August. Lion predation was also documented on multiple occasions in the early 1980's. It is probable that the current population contains as few as 9-10 ewes (including yearlings).

Mount Baxter Population

It was recognized in the late 1970's that the Mount Baxter population consisted of two separate subpopulations of ewes with different home range patterns, based on use of low elevation winter ranges (Wehausen 1979). A small amount of past telemetry data, as well as information from naturally marked ewes, suggested that these two subpopulations also had little overlap in the summer range. Thus, while these winter ranges (Sand Mountain and Sawmill Canyon) have received little use since 1986 (Fig. 1), the distinction of these subpopulations remains valid and will be used here. One notable feature of our efforts this past summer was an attempt to census both subpopulations. Summer work in previous recent years has been concentrated on the southern subpopulation (Sand Mountain herd) that occupies the crest south of Sawmill Canyon to Kearsarge Pass.

Sand Mountain Herd

During our 1994 census, we failed to find any sheep in this subpopulation north of Oak Creek; but based on various evidence we concluded that there were at least 4 ewes and 2 lambs in this region and probably not many more (Wehausen and Chang 1994). This area lies immediately above the Sand Mountain winter range. During this past winter, we checked this winter range regularly beginning in early January and documented the exact number and composition of sheep suspected for that region. They appeared during 25-27 January following a storm, distributed as 3 ewes and 2 lambs at the mouth of Black Canyon and 1 ewe in the rocks south of Sawmill Canyon (Fig. 1). We never saw the Black Canyon sheep again. However, in mid February, we began seeing the ewe on the south side of Sawmill Canyon again, but feeding out on the open slopes of Sand Mountain where sheep wintered in earlier years. She was documented there on multiple occasions through the end of March and is the first sheep seen on the slopes of Sand Mountain since the 1980's. We also recorded 1 ewe, 1 yearling ram, 1 2-3 year old ram, and 1 older ram later in spring on the lower east slope of Kearsarge Peak. Thus, a total of 10 sheep was documented for this population during winter and spring.

Summer work on this population took place between 4 July and 14 September, and included 3 day hikes from Onion Valley, and 3 multiday trips via Oak Creek. All of this effort was oriented toward the summer range of ewes. In total, we allocated 15 high country person days of survey to this population (where entrance and exit days of multiday trips are valued as half days). That effort returned only 3 groups of sheep -- one on each multiday trip. As in other recent years, we have sought to recognize individual sheep by various unique features. The result was that we were able to recognize unambiguously that the 3 groups seen were all the same group. However, on each successive sighting it grew by 1 ewe and a lamb, from 4 ewes and 1 lamb on Black Mt. on 7 July, to 5 ewes and 2 lambs on Mt. Mary Austin on 11 July, to 6 ewes and 3 lambs on Baxter Pass on 12 September.

The large amount of snow persisting into summer aided us in ascertaining via tracks where sheep had been. For instance, following the second sighting, we surmised that a small number of sheep had not been found south of Oak Creek because of tracks seen crossing snow patches on the south side of Little Onion Valley. These were likely the sheep that had joined our one ewe group when seen in September. Nevertheless, similar to last year, we feel certain that there were sheep in the Mount Baxter area that were never seen. Sign of sheep use on the top of Mount Baxter was very sparse, but not entirely lacking -- about what would be expected if the 6 sheep seen on the winter range were the only ones using this region. Flower head utilization on the summit plateau this summer was one third that recorded 2 years ago and only 13% of the utilization rate in the late 1970's (Table 1). One set of fecal pellets on the summit plateau of Mount Baxter from this summer was probably from a yearling. This is the only evidence we found of any survival of 1994 lambs, and suggests that at least one of the lambs seen at Black Canyon in January survived the winter.

The sighting rate of ewes in summer between Onion Valley and Mount Baxter followed the recent downward trend, dropping another increment this year (Figure 2). Flower head utilization in two favorite feeding areas on Black Mountain showed differing patterns this summer. The utilization of Polemonium increased slightly over 1993 levels, while that of Hulsea decreased markedly (Table 2). A likely explanation for this difference concerns snow patterns. The north side of Black Mountain comes substantially clear of snow early in summer before many surrounding areas. This appeared to be accentuated this year and may have resulted in more concentrated feeding there in the early summer when Polemonium was in flower. Hulsea blooms later than Polemonium. Hulsea was particularly late to bloom this year and was still very much in bloom in mid September when utilization measurements were made. As indices of population size, this year's data from Black Mountain for these two preferred forage species probably represent opposite biases. Averaged, they indicate a drop of over 40% in two years, which is consistent with the declining sighting rate (Fig. 2). When data from the summit of Mount Baxter are averaged with them, a decline in excess of 50% is indicated for the past two years. When all three sites are compared with the late 1970's, a decline of about 80% is suggested. This is probably an underestimate of the actual population decline, given that these are both particularly favored feeding areas.

Sawmill Canyon Herd

For the first time, no sheep were seen in the Sawmill Canyon winter range in 1995. The summer range of the population was investigated on three occasions:

a brief trip aborted due to rain in July, a week long trip in late August, and 1 day allocated to investigating the favored range south of Woods Lake from Baxter Canyon in September.

In addition to obtaining census data on this subpopulation, our summer objective also concerned better range mapping. In 1986, two radio collars were placed on ewes in Sawmill Canyon in late winter. While followup aerial telemetry data on these two ewes were less than adequate, the sparse information derived from the collars indicated that the previous northern boundary in Wehausen (1980) south of Mount Perkins was incorrect. One collared ewe was recorded to range from the ridge system west of Woods Lake to the top of Armstrong Canyon. An additional question concerned potential use by ewes of Goodale Mountain. In 1980, 16 sheep, including ewes, were discovered in Goodale Canyon in winter. This winter range was followed until 1987, as the number of sheep increased to a peak of 25 sheep, then declined. A lingering question has been whether these sheep were a wintering offshoot of the Sawmill herd and spent summer further south with the rest of the population, or whether they used Goodale Mountain as summer range. We investigated much of the crest between Division Creek and Goodale Mountain relative to this question.

We found ample sign that ewes use the crest and tops of eastern canyons as far as the south fork of Goodale Creek. Additionally, Mt. Wynne was used, and probably also Mt. Pinchot to a limited extent. The only group of sheep we saw in this region consisted of 3 ewes and a 2-yr old ram, which we watched as they crossed from the north flank of Mount Perkins to Mount Wynne. We had tracked them earlier in the day as they climbed out of Division Creek and dropped into Armstrong Canyon.

The only sheep sign we found on Goodale Mountain was sparse old pellet groups probably from occasional rams. Thus, we interpret the small population wintering in Goodale in the early 1980's as an offshoot from Sawmill Canyon. Its appearance there corresponded in time with (1) dropping numbers in winter censuses of Sawmill Canyon, and (2) increasing mountain lion predation.

The summer range south and west of Woods Lake frequented by this herd was still completely snowed covered when checked in late July. When checked in late August, we could find no sign of sheep use this year. However, when investigated a third time in mid September, we encountered fresh sign suggesting that sheep were just beginning to use the area this year. We located these sheep, a group of 7 ewes, 1 lamb, and 1 2-yr old ram. The ram was recognized as the one seen with the group on Mount Wynne, and colors of ewes in the group matched those from that same group. Thus, as with the Sand Mountain herd, we resighted our same group, but with additions.

When these are added to those found for the Sand Mountain herd, a total of 13 different ewes, 4 lambs, and 1 2-yr old ram was documented for the Mount Baxter herd. In comparison, we found a total of 17 ewes between these two herds in the summer of 1994. While again we certainly missed some ewes this summer, we are confident that the total Mount Baxter herd does not exceed 20 ewes; thus we estimate it at 15-20 ewes. Relative to the 108 ewes counted on the winter range in 1978 (Wehausen 1980), this represents a decline of 81.5-86%, which is consistent with the decline in utilization of Polemonium and Hulsea flowers. A small overall population is also suggested by the frequency with which we resighted sheep previously seen.

Acknowledgments

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Table 1. Percents of flower heads of Polemonium eximium and Hulsea algida consumed at three sites in the 1970's, 1993, and 1995.

LOCATION	SITE NO.	FLOWER SPECIES	YEAR	PERCENT EATEN	NUMBER SAMPLED
MT. BAXTER	5	Polemonium	1975-78	94	1161
			1993	39	402
			1995	12	1266
BLACK MT.	18	Hulsea	1975-77	93	809
			1993	44	311
			1995	8	520
BLACK MT.	19	Polemonium	1975-77	64	1957
			1993	22	408
			1995	30	706

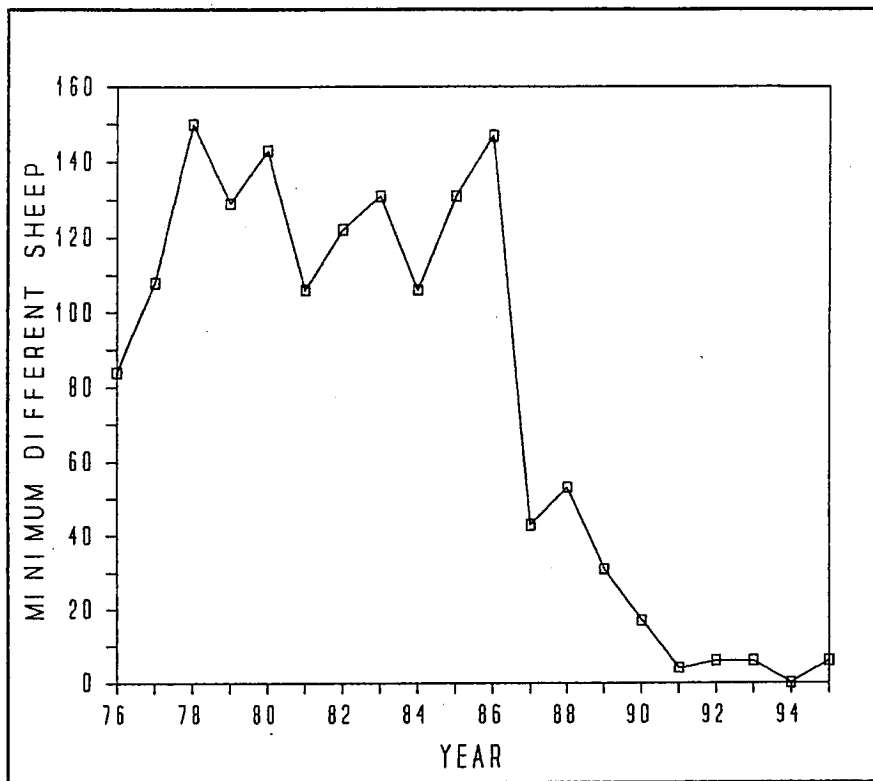


Fig. 1. Minimum number of different sheep accounted for on the Sand Mountain winter range, 1976-95.

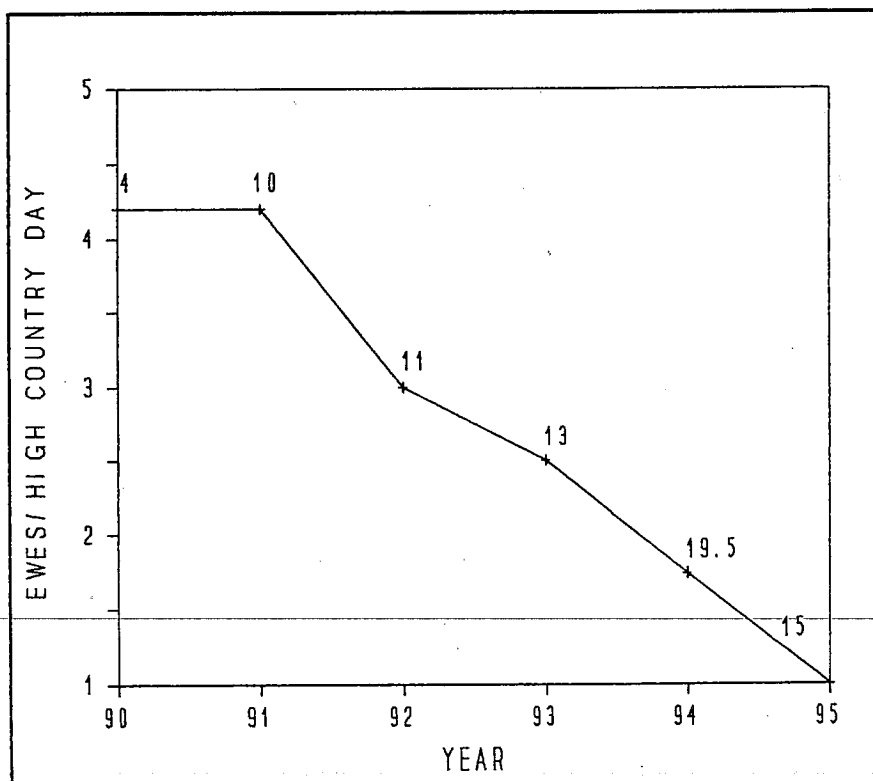


Fig. 2. Recent summer sighting rates of ewes between Onion Valley and Mt. Baxter. Sample sizes (days of survey) are above points.

