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**REPORT ON THE STATUS OF THE LEE VINING CANYON
BIGHORN SHEEP REINTRODUCTION
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INTRODUCTION

California bighorn sheep (*Ovis canadensis californiana*) have historically ranged from the central to southern Sierra Nevada in areas that contain rocky terrain and suitable wintering habitat (Jones 1950, Wehausen 1979). With the arrival of miners and the introduction of domestic livestock in the 1850s, bighorn sheep numbers began to suffer a drastic decline (Wehausen 1980). The combination of overhunting, competition for forage, and, especially, diseases contracted from domestic sheep decimated mountain sheep populations throughout the Sierra Nevada (Dixon 1936, Grinnell and Storer 1924, Jones 1950, Wehausen 1988). By the late 1970s, mountain sheep number had been reduced to approximately 250 sheep dispersed in two remnant herds in the Mt. Baxter and Mt. Williamson areas (Wehausen 1980).

Beginning in 1979, the California Department of Fish and Game (CDFG) implemented a program aimed at restoring bighorn sheep to their historic range in the Sierra Nevada. This program resulted in the formation of the Sierra Nevada Bighorn Sheep Interagency Advisory Group (SBIAG), a coalition of CDFG, U.S. Forest Service, Bureau of Land Management, and the National Park Service (NPS). Wheeler Crest was the site of the group's first reintroduction effort, followed by the release of a total of 26 sheep during 1980 and 1982 in the Mt. Langley area (Andaloro and Ramey 1981). In order to ensure genetic integrity of the Sierra Nevada subspecies, all transplanted sheep were acquired from the Mt. Baxter herd (Wehausen 1979).

In March 1986, 27 bighorn sheep were captured from the Mt. Baxter winter range and released 120 miles north in Lee Vining Canyon near the eastern boundary of Yosemite National Park. Eleven additional sheep from Mt. Baxter were released in the same location in 1988 after severe weather and accidents in 1986 resulted in the death of nine sheep from the original reintroduction (Bleich et al. 1991, Chow 1991).

A total of 36 radio transmitter collars were placed on the sheep released in Lee Vining Canyon, but only five collars were functioning as of September 1992. In 1992, it was agreed by the members of SBIAG that an effort should be made by CDFG to capture sheep in the Lee Vining herd and install new collars to enhance future monitoring efforts. On April 20, 1993 CDFG successfully darted and collared one yearling ewe, but numerous capture attempts over the next two days were unsuccessful due to high winds.

The Research Division of Yosemite National Park studied the Lee Vining reintroduction from 1986 to 1991 to determine the initial success of the project (Chow 1991, Moore 1993). This included studies of food habits, habitat use, survival, reproduction, cause of mortality, and recommendations for a long-term monitoring program. These studies provided the basic methods and knowledge necessary to conduct monitoring of the herd, and provided the baseline data for evaluating subsequent changes.

METHODS

The summer monitoring effort was conducted by a team of two people from 1 July to 4 September, 1993. Monitoring concentrated on censusing the new lambs born this year, determining summer habitat use, and confirming herd size and composition data collected during the winter and spring.

The only radio transmitter collar functioning this summer was the one put on a yearling ewe by CDFG in April of this year; all others worn by sheep had expired. A Telonics TR2/TS1 receiver/scanner (164-165 Mhz) and a hand held, 2 element, H-type, directional antenna were used to locate signals. A Bushnell scope with 15-45x zoom and 60x fixed eyepieces, a 20x80 binoculars aided in visually locating and identifying sheep.

Sheep monitoring consisted primarily of searches done on foot in the Tioga Crest and Warren Bench regions, as well as Bloody Canyon. Roadside scanning in Lundy Canyon, along Tioga Pass, and along the Saddlebag Lake Road was also used to locate sheep. Short hikes away from the road were used to gain vantage points during roadside scanning. Monitoring followed methods established in the California Bighorn Sheep Monitoring Protocol (Yosemite National Park 1992), but was responsive to current movements and distribution of sheep. The two team members often hiked toward vantage points by different routes to increase the coverage of terrain. Hand-held radios were used to maintain contact between team members while separated.

When sheep were observed, data on location and group composition were recorded. The observation point from which the sheep were seen, and other pertinent information were also recorded. In order to reduce the chances of counting sheep more than once, efforts were made to survey the other primary areas in the days following a sighting of sheep.

RESULTS & DISCUSSION

Census efforts were hampered by the low number of functional radio collars on sheep. The collars are important not only for finding the locations of sheep, but also for identifying individuals in groups and distinguishing groups by the presence of these individuals. This difficulty required that census data be compiled in general age and sex categories (Table 1). Derivation of these numbers was partially from data collected in winter and spring counts (Chang 1993).

The weather conditions this summer were generally conducive to field work, but many upper level low pressure systems that passed over the Sierra in early summer created frequent high winds that made observations on some days difficult. There were only a few days of field work that had to be cut short due to the threat of thunderstorms. After a winter of heavy snowfall, extensive snow coverage was still present at higher elevations when summer

monitoring began in July. Warm weather, however, rapidly melted the snow, resulting in little coverage by the beginning of August.

Table 1. Estimates of population size and composition of sheep observed in 1992 and 1993.

Min. - possible

	Lee Vining		Bloody Canyon		Total	
	1992	1993	1992	1993	1992	1993
Adult ewes*	26-29	34-39	3	1	29-32	35-40
Adult rams*	12	20-24	2	2	14	22-26
yearling	9	10	0	0	12	10
Lambs	16	13	1	0	17	13
Total	63-66	77-86	6	3	69-72	80-89
* > 2 years of age						

Population Size:

The 1993 summer census conservatively estimates the Lee Vining herd at 77-86 bighorn sheep. The group composition included 34-39 ewes (2 yrs +), 10 yearlings, 13 lambs, and a minimum of 20 rams. This is an increase of 22.2 - 30.3% over last year's estimate of 63 to 66 sheep in this herd. The high percentage increase can be attributed to the number of newborn lambs and also to more accurate counts of the rams. The sub-group of bighorn sheep found last year in Bloody Canyon was not seen this summer, but one ewe and two rams were observed there earlier this spring. Therefore, the total reintroduced population is currently estimated at between 80 and 89 (15.9 - 20.8% increase over 1992: 69 to 72 sheep) if only three sheep remain in the Bloody Canyon band.

The combination of winter, spring, and summer censuses enabled a more accurate count of the population, especially of rams. Last year, only 14 rams were counted, suggesting that either this segment had suffered high mortality, or, more likely, the number of rams was underestimated because of the difficulty in locating them (Hansen and Thompson 1992). This year, a total of 22 to 26 rams were counted, more accurately reflecting the size of this population component.

Reproduction:

Thirteen lambs were observed in the Lee Vining herd in 1993, giving a lamb:ewe ratio of 32:100 to 37:100 using the estimate of 35 to 40 ewes of age two years or older. All of these ewes, however, were probably not of reproductive age. Some 2-year-old ewes may not have been sexually mature during fall breeding, giving an artificially low ratio.

Mortality:

During August, a faint mortality signal from a radio collar was picked up from the direction of Lamb Ewe Basin (Map 1). After extensive searches on foot, collar 4W from a 10-year-old ewe was found on the south ridge of peak 11952. The collar was lying in the open on a hillside, and only a small bone fragment of an unidentifiable species was found in the area. Last year's field notes indicated that the signal from this collar was consistently received from the same general area throughout last summer, but the sheep was never observed and no recognition of a mortality signal was noted. Nonetheless, it is possible this sheep died over a year ago.

A relatively severe winter may have reduced survival of last year's lambs. Seventeen lambs were born last year and ten yearlings were seen this year; a survival rate of 59%. Overwinter survival of lambs in 1992, a drought year, was 75%. The reduced survival this winter may have been the result of increased predation. One lamb is known to have been killed by coyotes in early March, and coyote tracks were often seen in association with sheep tracks during the winter and spring census (Chang 1993).

A dead two-year-old ram was found by a skier near Ellery Lake during the winter. Necropsy results are still pending, but an initial examination suggested the sheep died from head injuries.

Only three sheep were seen in Bloody Canyon this winter and spring (Chang 1993), and none were seen here during the summer where a total of six sheep were last year. This may indicate that either this group was subject to high mortality or they rejoined the main herd.

Movement and Distribution Patterns:

Distribution and general range use by the two main groups on Mt. Warren area and on Tioga Crest in 1993 were similar to the previous year (Map 2). The above-average winter snowfall left many large patches of snow that persisted until late summer. Meltwater from these patches provided moisture that supported plentiful growth of forage. At the beginning of the survey in early July, one large nursery group (ewes, lambs, and yearlings) could be consistently seen in the Dore Cirque and on Mt. Scowden (Map 1), where the safety of the cliffs provided escape terrain for the newborn lambs. By mid-July, the large band divided into smaller groups which mostly stayed on the rugged cliffs of Mt. Scowden, but were

occasionally seen foraging on Dore Pass Plateau. During the first week of August, the larger band regrouped and was found on the East cliffs of Tioga Peak, and foraging on the rocky cliffs above Ellery Lake.

The other main nursery group was spotted on the south-facing plateau of Mt. Warren in early July by following signals from the only functional radio collar. The group could be consistently found on the Warren Bench, and they appeared to use the rocky cliffs above Lake Canyon for escape terrain. They were never observed on Gilcrest Peak. As the season progressed, this large band also divided into smaller groups that were seen foraging on the Warren Plateau.

The majority of ram sightings occurred on the East slope of Mt. Warren. A group of 15 rams were seen this summer foraging on the flat plateau south-east of Mt. Warren, and a few rams were spotted on Dore Pass and on the Tioga Crest above Gardisky Lake. The rams on Mt. Warren utilized the cliffs above the depression to the east of peak 11952 and the steep north slopes of Mt. Warren for safety.

Despite numerous searches, no sheep were found in the area of Bloody Canyon where six were found last year and three were seen this spring. Unconfirmed reports of sheep on Kuna Crest and Dana Plateau were investigated, but no positive signs of sheep presence were found. Groups of old tracks were seen in the snow gully between Dana Plateau and Mt. Dana, but no recent evidence of sheep using these areas was found. Multi-day trips in the area from Mono Pass to Kuna Pass area were also unsuccessful in finding sheep, but suspected sheep tracks were found on the south slope of Mt. Lewis and in the area of Parker Pass. Most of the potential sheep habitat near Mt. Gibbs was surveyed from different approaches with negative results. Areas from Mt. Lewis south to Koip Peak offer potential habitat into which the sheep could have dispersed, but time limitations inhibited adequate survey of these areas. In this year of abundant precipitation and runoff, improved forage abundance in adjacent areas could have caused the Bloody Canyon group to expand their range.

RECOMMENDATIONS

Yearly monitoring of the Lee Vining herd of bighorn sheep should continue into the foreseeable future. At the present rate of population growth, the herd may reach over 100 sheep within the next two years, barring any unforeseen problems with survival or reproduction. This would be a significant milestone because the number of 100 sheep has been identified by SBIAG as the minimum for a self-sustaining herd (SBIAG 1984).

The Lee Vining herd survived the above-normal snowfall that occurred on their range this winter. The high mortality of 1986 due to heavy snowfall is, however, a reminder of how weather can cause a setback in herd growth, and emphasizes the importance of continued monitoring.

Although mountain lion predation was not documented this year, monitoring efforts should be continued in winter and spring to determine the influence of predation on the herd. The coyote predation seen and suspected this year may be a more significant mortality factor in heavy snow years, and should be monitored.

Additional functioning radio collars must be placed on bighorn sheep in the Lee Vining herd in order for future monitoring to be effective and accurate. The collars are crucial aids to locating sheep, and identification of individual sheep and the groups of which they are a part. Herd survival, reproduction, and habitat use can be more accurately and efficiently assessed, saving time and money, and enabling more rapid management reaction to counter threats to the herd.

The Bloody Canyon group of sheep should be monitored more intensively. The movement of an adult ram from the main herd into Bloody Canyon last year, and the possible movement of the group out of the canyon this year are worrisome. Heavy domestic sheep grazing occurs less than two miles down canyon from the areas known to be used by bighorns. The proximity of domestic sheep and the evidence of bighorn sheep movement in this area indicate a potential health threat that could endanger the survival of the entire reintroduced population. An Animal Management Plan (AMP) that moves grazing allotments further from the bighorns should be pursued by involved land management agencies.

In July, a large herd of domestic sheep was driven south from Mt. Olsen along the east flank of Mount Warren to Bloody Canyon in apparent violation of the Forest Service grazing permit. This movement brought the domestic sheep dangerously close to range used by bighorns on the east side of Mt. Warren. Such permit violations should be strongly discouraged.

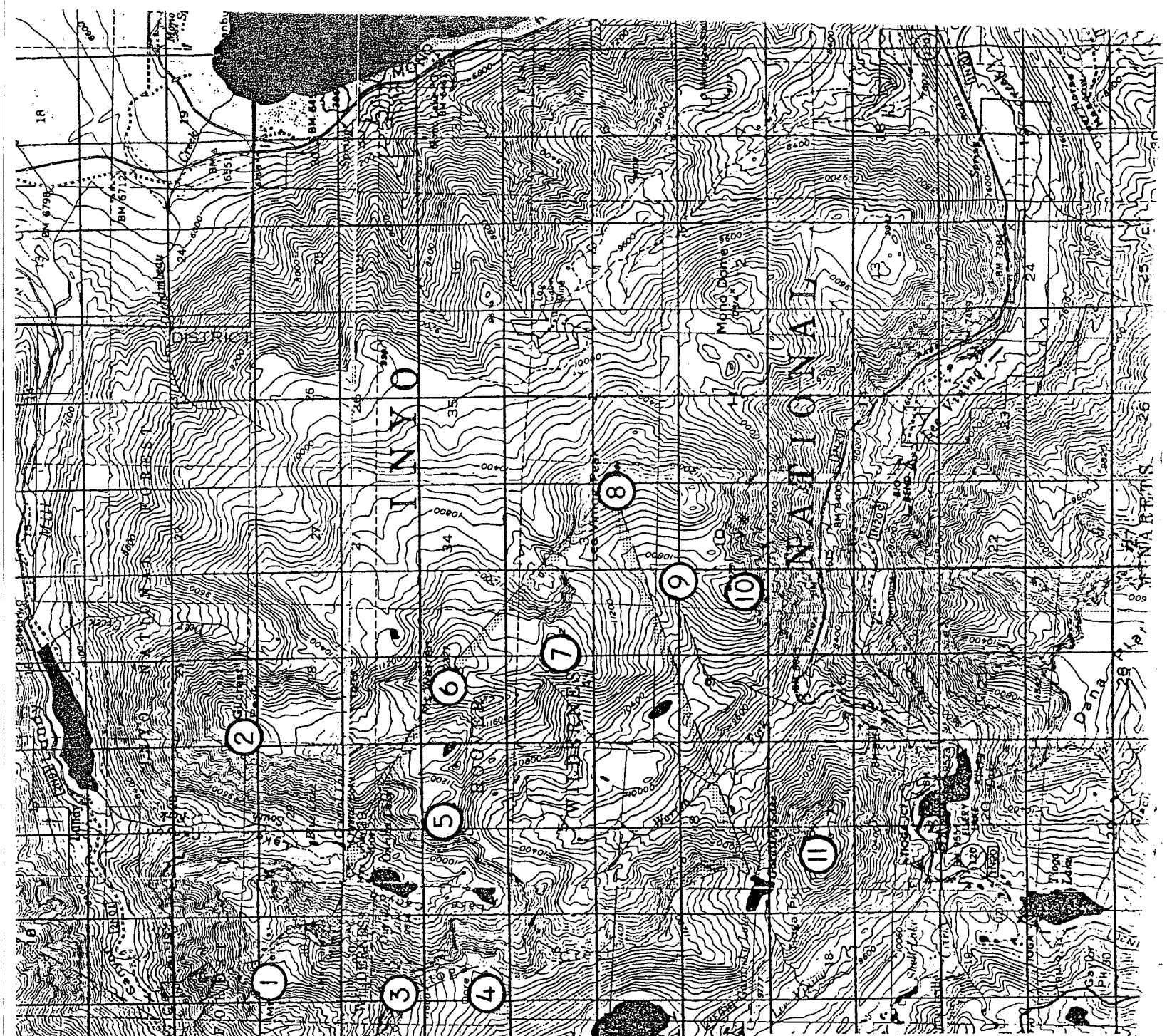
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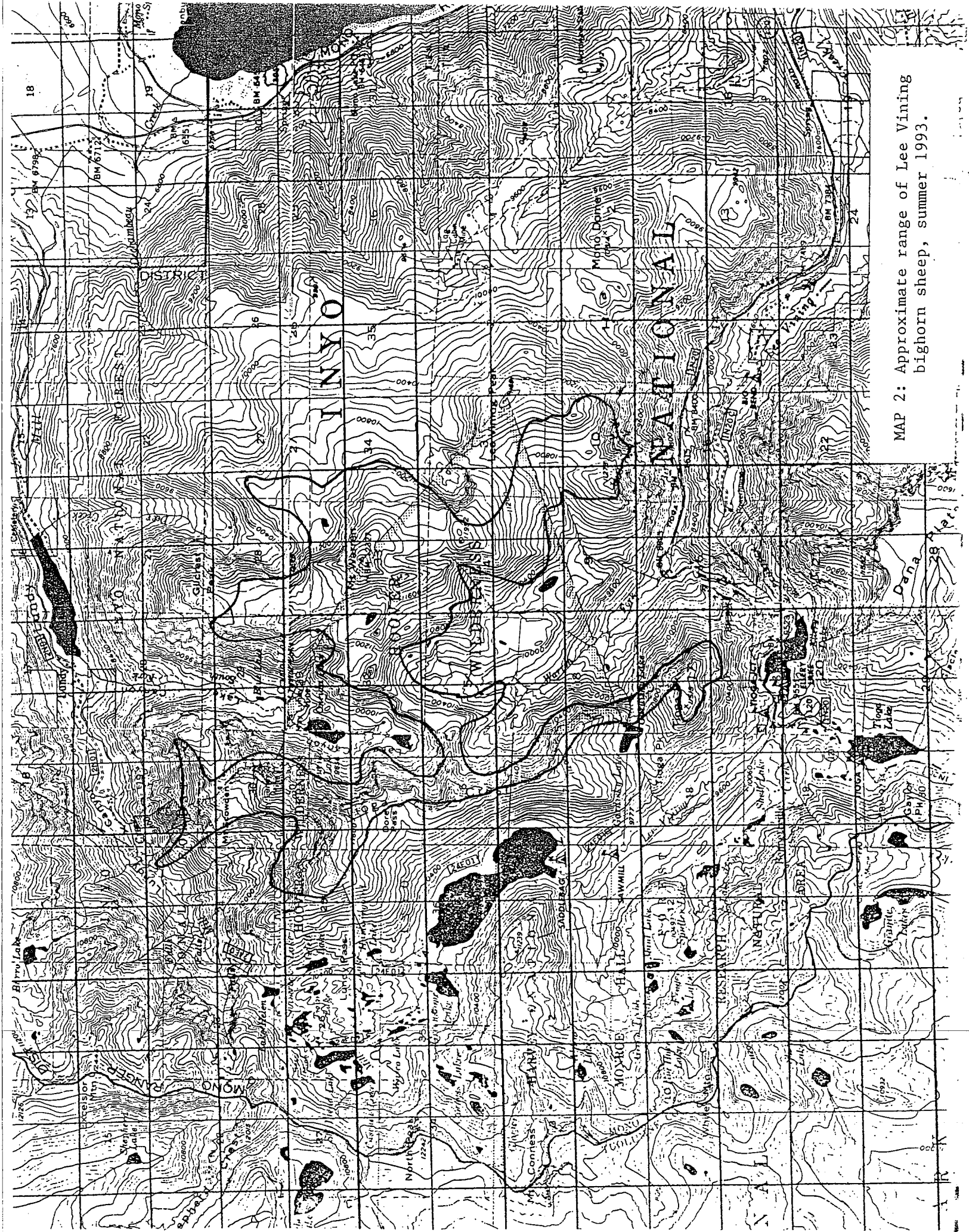
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Landmarks Map
Bighorn Sheep Monitoring

- 1..... Mount Skowden
- 2..... Gilcrest Peak
- 3..... Peak 11911
- 4..... Dore Pass
- 5..... "Peak 32"
- 6..... Mount Warren
- 7..... Peak 11952
- 8..... Lee Vining Peak
- 9..... Lamb/Ewe Basin
- 10..... Peak 11273
- 11..... Tioga Peak



MAP 2: Approximate range of Lee Vining bighorn sheep, summer 1993.