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A History of Bighorn Sheep Management in the Sierra Nevada

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Abstract

Bighorn sheep (*Ovis canadensis*) populations in the Sierra Nevada experienced a major decimation beginning with the influx of gold miners in the mid-1800s. In 1878, these animals received full protection from the California state legislature; yet their numbers continued to dwindle, leaving only two remaining populations one century later. A reintroduction program of trapping from one of these native populations and moving sheep to historic ranges was begun in 1979. To date, this program has added two populations in the Sierra Nevada. Future efforts are planned to continue this program, with a goal of minimally establishing significant populations in different geographic regions of the Sierra Nevada, so as to help ensure the future of this life form in its native habitat.

Key Terms

Bighorn sheep, *Ovis canadensis*, history, management, reintroduction.

Introduction

Historically, bighorn sheep populations were scattered along the east side and crest of the Sierra Nevada from the Senora Pass region south to Jawbone Canyon. Additionally, substantial populations occurred on the Great Western Divide, and in the Truckee river drainage (Jones, 1950; Wistar, 1914). Most of these populations disappeared during the 1800s and early 1900s as European man and his domestic animals invaded these mountains. This paper is a brief historical perspective on both the demise of these native sheep and the concepts developed and actions taken for their conservation.

Historical Influence on Bighorn Sheep Populations

The first significant impact of white man on bighorn sheep populations in the Sierra Nevada was the influx of miners beginning in 1849. These miners ate any meat that was convenient, including bighorn sheep, and market hunting that arose to supply mining camps and towns probably caused the elimination of some populations that were locally vulnerable when concentrated on small winter ranges.

The second, and probably most severe impact, was the initiation of summer livestock grazing in the Sierra Nevada. This began as a result of severe droughts that caused considerable mortality among the cattle grazed in the Central Valley, and caused livestock operators to seek other summer pastures in the Sierra Nevada (Vankat, 1970). The southern end of the range was the first to receive this grazing, and already had cattle by 1861. Cattle were quickly replaced by domestic sheep because they could be grazed over more extensive areas in the rugged high country; and stocking rates became excessive (Vankat and Major, 1978). Clarence King noted great destruction from overgrazing on the Kern Plateau by 1873, and Magee wrote in 1885 that severe overgrazing was more evident in the Mount Whitney region than elsewhere in the Sierra Nevada (Vankat and Major, 1978). Domestic sheep herded through the area every summer apparently numbered in the hundreds of thousands (Vankat, 1970). The impacts of these domestic sheep on the native bighorn were twofold: competition for forage where their ranges

overlapped, and introduced diseases. The latter was probably the most devastating because of a much greater potential for extirpating entire populations of native sheep. One such die-off due to scabies was recorded in the Great Western Divide region in the 1870s (Jones, 1950). Only recently have some of the adverse effects of domestic sheep on bighorn sheep been adequately documented (Goodson, 1982; Foreyt and Jessup, 1982).

Yosemite and Sequoia National Parks were created in 1890 (Storer and Usinger, 1970), and resulted in large numbers of domestic sheep being excluded from these lands (Austin, 1906). A shift in areas of grazing pressure was probably a result of this change, and may have caused intensified grazing on bighorn sheep ranges along the east side of the Sierra Nevada.

Patterns of Bighorn Sheep Disappearance

Historical records from the last century are few. Many populations of bighorn sheep disappeared during that century without any or much trace of their existence being recorded. Skull remains found much later are often the only evidence of previous occupation. Consequently, any attempt to assess patterns of disappearance of bighorn sheep populations is severely limited by inadequate information.

The decline of bighorn sheep in the Sierra Nevada appears to fall into two periods: one of rapid decimation occurring over about two to three decades beginning around 1860, followed by a lengthy period of slower decline. Two regions that apparently lost populations early were the Yosemite area and the Great Western Divide. John Muir was a keen naturalist and one of our best sources of information from the last century. He wrote of his experience with bighorn sheep, including a chapter in his book, *The Mountains of California* (1894). Yet, a search of his published writings and journals (Wolfe, 1979) suggests that he may never have seen a live bighorn sheep in the Yosemite region, despite much time spent in the high country of that area. His only mention of live bighorn there was a report he received of three killed in Bloody Canyon around 1870 (Muir, 1894). Grinnell and Storer's (1924) conclusion that bighorn were essentially gone from the Yosemite region by the early 1880s seems accurate. Muir's own statement published in 1898 was: "Few wild sheep, I fear, are left hereabouts." He noted their vulnerability to hunting when forced to low-elevation winter ranges by snow, but he never specified any wintering areas. Grinnell (1935) concluded that uncontrolled hunting by miners and sheepherders was the cause of the disappearance of bighorn from the Yosemite area. Two early periods of intense mining in that area, one beginning in 1857, and the other in the 1870s (Anon., 1924) might easily account for the demise of these native sheep populations.

The other region that apparently lost bighorn sheep populations early was the Great Western Divide, where the previously mentioned scabies epidemic in the 1870s was the probable cause (Jones, 1950). Undoubtedly, other populations also disappeared in this period without record.

Based on the writings of Ober (1911, 1914-16, 1931) and Inyo National Forest Annual Fish and Game Reports from the 1920s and 1930s, a number of bighorn sheep populations in the Owens Valley region survived into the twentieth century. The apparent disappearance of some of these in the 1920s and 1930s coincided with heavy grazing by domestic sheep in that area (Wehausen, 1980). Jones (1950) claimed that five populations remained in 1948, but the evidence he presented only supported the existence of two and possibly three. In 1978, there remained only two--the Mount Baxter herd and the Mount Williamson herd (Wehausen, 1979, 1980).

History of Management

The first management action affecting bighorn sheep in the Sierra Nevada occurred in 1876 when all bighorn sheep in California received seasonal protection from the state legislature, followed by temporary full protection in 1878 and permanent full protection in 1882, a status still in effect (Weaver, 1982). The early date of these actions underlies how quickly visible decimation had occurred following the influx of people in the 1850s. For a number of decades, simple protection from hunting was believed to be the answer to decimated wildlife populations

(Schmidt, 1978). Populations were expected to flourish and quickly recolonize former ranges. By the 1930s, when such a response did not seem to be apparent in bighorn sheep in the Sierra Nevada, there appeared a number of suggestions as to why, including 1) excessive predation (Bailey, 1932); 2) poaching (Bailey, 1932; Dixon, 1936); and 3) competition from domestic sheep (Wright, et al., 1933; Grinnell, 1935). While none of these authors offered any data by which to support or reject any conjecture, the concept of competition from domestic sheep apparently led to elimination of domestic sheep grazing in known areas of bighorn sheep occupation (Dixon, 1936); however, the last domestic sheep grazing adjacent to bighorn sheep ranges was not terminated until 1961 (McCullough and Schneegas, 1966).

In 1940, the National Park Service and the Sierra Club proposed the establishment of a sanctuary on Inyo National Forest land for the remaining population, the Mount Baxter herd (Colby, 1940a, 1940b; Blake, 1940). This proposal was rejected the following year by the US Forest Service and the California Dept. of Fish and Game on grounds that 1) insufficient information existed by which to judge the need for such a refuge; and 2) the publicity associated with a sanctuary might attract further poaching rather than reduce it. Instead, they called for an in-depth study (Blake, 1941). Due to World War II, this did not come to pass until 1948, when Fred Jones spent a summer in the mountains on a master's degree project (Blake, 1949; Jones, 1950).

The length of Jones' field work was inadequate to provide much useful data. He clearly established the existence of the Mount Baxter and Mount Williamson herds, and possibly a Mount Langley herd. Beyond that, he added to the previous list the unsupported conjectures that population recovery was hindered by 1) a shortage of winter forage due to lasting changes in vegetative composition from past overgrazing by livestock; 2) competition in winter from a high deer population; and 3) increasing human use of the high country that might be having adverse effects. Jones' (1950) estimate of 390 bighorn sheep remaining in the Sierra Nevada had no valid empirical basis.

During the winters of 1963 to 1965, Riegelhuth (1965) and McCullough and Schneegas (1966) made the first winter investigation of some of the populations Jones (1950) claimed to exist. Only the Mount Baxter and Mount Williamson herds could be located. Riegelhuth (1965) added to the conjecture list the possibility that competition on bighorn winter ranges from the growing tule elk population in Owens Valley might have an adverse impact. As a result of clear identification of some areas of winter use of the Mount Baxter herd, cattle grazing that overlapped this range was eliminated at the end of 1965 by the US Forest Service (McCullough and Schneegas, 1966).

As biologist for Inyo National Forest beginning in 1967, Dunaway investigated various aspects of bighorn sheep in the Sierra Nevada. He concluded that two of the five populations Jones (1950) claimed to exist in 1948 had disappeared (Dunaway, 1971b). However, he provided no evidence for the existence of a third population, the Mount Langley herd and, like Jones (1950), his population estimates had no clear empirical basis (Dunway, 1970, 1971a, 1971b). Dunaway adopted Jones' hypothesis that increasing human disturbance was causing a decline in the bighorn sheep. As supporting evidence, he used a correlation between increased human use in areas that had lost populations since Jones' study compared with areas he considered still inhabited (Dunway, 1971b). On critical examination, this argument fails, since Jones also failed to provide convincing evidence of the existence of two of these populations.

Despite the weakness of this argument, two preserves known as Bighorn Sheep Zoological Areas were created by the US Forest Service in 1971 in the ranges of the Mount Baxter and Mount Williamson herds with restrictions on human use. Simultaneously, adjacent National Park lands in bighorn sheep summer range received more restrictive designation. Also in that year, bighorn sheep in the Sierra Nevada were classified as rare by the State of California, a designation that called for a recovery plan, research, and reintroduction, so as to achieve their removal from rare status (Leach, et al., 1974).

In 1974, long term research that currently continues was initiated on the two native populations in the Sierra Nevada. The first phase of this research culminated in two reports: one concerning management questions (Wehausen, 1979) and one concerned with biology

(Wehausen, 1980). The hypothesis of human disturbance as an adverse impact on populations was tested and rejected for the Mount Baxter herd (Wehausen, et al., 1977; Wehausen, 1980), and restrictions on human use were accordingly relaxed.

The Mount Williamson herd was found to be small, numbering 30 (Wehausen, 1979, 1980), and has subsequently been found to be very stable. The Mount Baxter herd was found to be increasing, and numbered 220 in 1978 (Wehausen, 1980). Consequently, the major recommendation from this first study phase was to use the Mount Baxter herd as reintroduction stock (Wehausen, 1979). A reintroduction program was initiated, with 60 bighorn removed between 1979 and 1982 for relocation to two sites in the Sierra Nevada, and one in northeastern California. The two reintroduced populations in the Sierra Nevada (Wheeler Crest and Mount Langley) are each known to have reached population sizes of at least 30 in recent years.

Another recommendation from the first phase of this study was the creation of an interagency advisory group concerned with the management of bighorn sheep in the Sierra Nevada (Wehausen, 1979). The California Department of Fish and Game created such a group in 1981. In 1984, this group produced a document titled, "Sierra Nevada Bighorn Sheep Recovery and Conservation Plan" (SNBSRCP), which outlined management goals, and was signed by appropriate agency administrators. Thus, the three actions called for under the state rare listing have all been implemented. It remains to continue them until a total population level is achieved to warrant state delisting from rare status.

Future Directions

The SNBSRCP set as a general objective the insurance of future existence of bighorn sheep in the Sierra Nevada. While it is not clear whether these sheep are taxonomically distinct from other bighorn sheep, the underlying goal of this plan is to preserve the gene pool of these bighorn in this mountain range. As such, the first management goal of this plan is to ensure the health of native populations, especially the Mount Baxter herd, since its ability to provide reintroduction stock is integral to the overall management objective.

The second management goal of the SNBSRCP is the establishment of at least three populations (including the Mount Baxter herd) that are both large (exceeding 100 sheep) and geographically distant from each other. The rationales behind this goal are: 1) that the size of such populations will allow their use as reintroduction stock in the event of catastrophic loss of one or more populations; and 2) that geographic isolation helps ensure that at least one such large population will survive such a catastrophic event (e.g., a disease epizootic). The third and ultimate goal of the SNBSRCP is the return of bighorn sheep to *all* former ranges in the Sierra Nevada where it is ecologically, economically, and politically feasible.

As part of the first goal above, yearly careful monitoring of the Mount Baxter herd is specified. Currently, this takes the form of winter censuses carried out by the author. A disease epizootic is the most likely source of a catastrophic loss of this population. Since such epizootics usually occur at high population densities, the management goal for this population is to continue its density through removals for reintroduction. These removals will attempt to approximate a maximum sustained yield harvest. This will entail removal of about 20 sheep for one reintroduction every 2 to 3 years (Wehausen, 1983).

The desire to establish geographically isolated populations provides an immediate criterion for selecting additional reintroduction sites. The first such priority is Lee Vining Canyon, a site that would also return bighorn sheep to Yosemite National Park as part of their summer range. This reintroduction was originally planned for February 1985; however, a decision by Inyo National Forest not to terminate summer grazing of domestic sheep in Lee Vining Canyon until alternative grazing lands are found has indefinitely delayed this reintroduction.

A second geographically isolated area with a high priority for reintroduction is the Great Western Divide. This potential reintroduction is currently being explored by the National Park Service.

Management History in Retrospect

One century elapsed between the time when a concern for the future of bighorn sheep was expressed through legislative action and the time when the declining population trend in the Sierra Nevada was actually reversed. Why? First, early management was based on a false premise--that protection alone would lead to reoccupation of historic range. This assumption was invalid for two reasons: 1) it assumed that overhunting was the sole cause of population losses, whereas this was probably the case only in isolated instance; 2) it assumed that once the decimating factor was removed, population recovery and recolonization of old ranges would follow quickly. This latter argument represents a general misconception of the biology of bighorn sheep, a species inherently slow to colonize due to the patchy nature of their habitat (Geist, 1971).

A second reason for the long delay in reaching a management policy that would reverse the declining population trend was a lack of adequate data. What passed for information largely consisted of guesses about population sizes, and even locations of populations. Consequently, hypotheses about factors potentially controlling distribution and abundance of bighorn sheep were stacked one on another with no basis for selecting one over another. It is also noteworthy that the factor probably of greatest importance, diseases introduced from domestic sheep, was not among the early conjectures. The lack of a solid scientific approach to the management of these bighorn is a reflection of the general state of the "art" of wildlife management that prevailed until recent decades.

A third reason for the century-long delay was the lack of incentive among agency personnel potentially responsible for their management. Because these sheep were not legally hunted, there was little political incentive to develop a management program that would ensure their future. Such an incentive, however weak, had to await the development of sufficiently enlightened politicians and public that would value a species for its own existence. The result was a century of passive management when a more active management was needed.

In light of the ignorance under which those concerned with the future of native sheep in the Sierra Nevada operated in the early decades of this century, it is reasonable to ask what fundamental ignorance we may be operating under currently. I can suggest a couple of areas. One concerns the limit of suitable habitat. We have very few historic records of specific locations where extirpated populations lived; and we have a very limited example from native populations by which to judge potential reintroduction sites. Our experience so far has been enlightening as to our ignorance about preferred habitat for bighorn sheep in the Sierra Nevada. The other area of our potential ignorance concerns the role of introduced diseases that appear to persist in bighorn sheep populations, notably the virus *Parainfluenza-3*.

Wildlife management in general has historically been dependent on and limited by basic scientific information, both in terms of ecological concepts and specific data on populations in question. Bighorn reintroductions being carried out in the Sierra Nevada and elsewhere are experiments in themselves. Hopefully, we will be able to continue to expand our understanding of bighorn sheep from these experiments and apply this understanding to refine future management efforts.

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