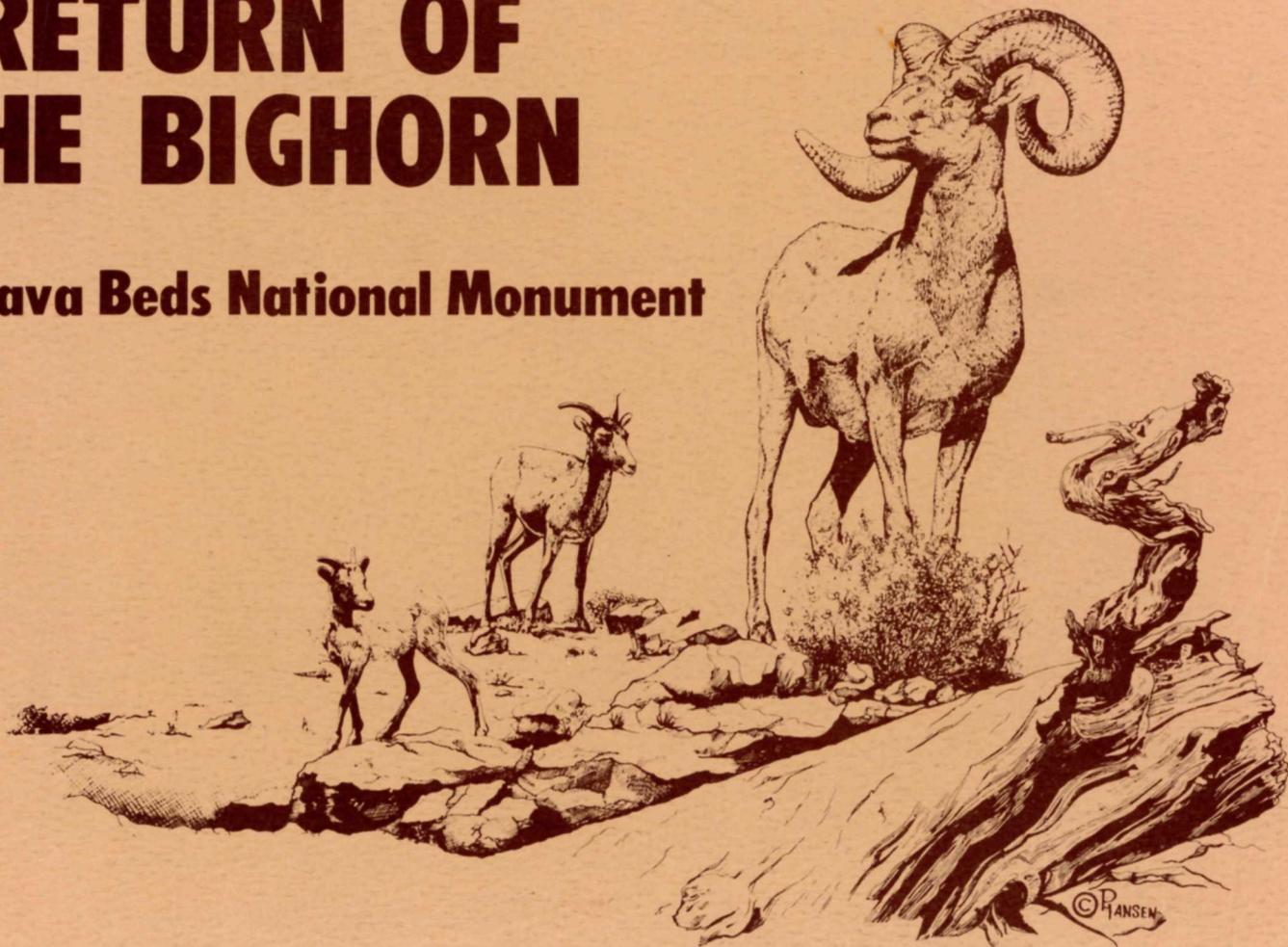


RETURN OF THE BIGHORN

to Lava Beds National Monument





RETURN OF THE BIGHORN TO LAVA BEDS NATIONAL MONUMENT

by James A. Blaisdell

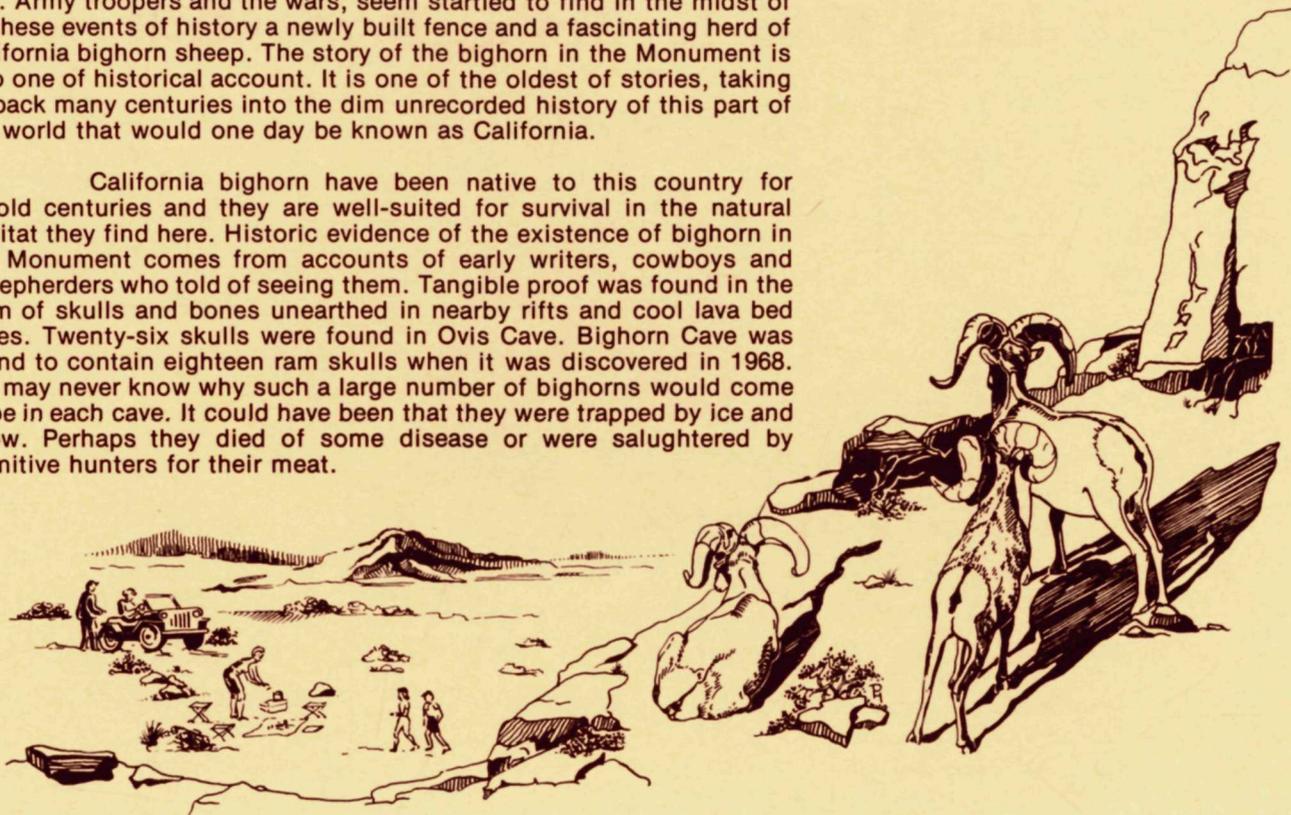


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INTRODUCTION

Visitors to Lava Beds National Monument, their thoughts filled with volcanism of the past, Captain Jack and his band of Modocs, U.S. Army troopers and the wars, seem startled to find in the midst of all these events of history a newly built fence and a fascinating herd of California bighorn sheep. The story of the bighorn in the Monument is also one of historical account. It is one of the oldest of stories, taking us back many centuries into the dim unrecorded history of this part of the world that would one day be known as California.

California bighorn have been native to this country for untold centuries and they are well-suited for survival in the natural habitat they find here. Historic evidence of the existence of bighorn in the Monument comes from accounts of early writers, cowboys and sheepherders who told of seeing them. Tangible proof was found in the form of skulls and bones unearthed in nearby rifts and cool lava bed caves. Twenty-six skulls were found in Ovis Cave. Bighorn Cave was found to contain eighteen ram skulls when it was discovered in 1968. We may never know why such a large number of bighorns would come to be in each cave. It could have been that they were trapped by ice and snow. Perhaps they died of some disease or were slaughtered by primitive hunters for their meat.



By the late 19th century, bighorn suffered a rapid decline in numbers and eventually vanished completely from this part of their range. Loss of the bighorn in the Monument has been blamed on such factors as severe winters, competition with domestic livestock for forage, predators, disease, parasites and poaching. They were not fully protected by law in California until 1873.

Probably many factors played some part in bighorn decline, but disease must have totally eliminated them. Many must have died from pneumonia triggered by severe cases of scabies. This disease was a skin infection caused by mites carried on domestic sheep that ranged throughout this area in the late 1800's. Scabies causes loss of insulating hair and fleece. The animals die of pneumonia due to exposure to the elements and from infection caused by the bites of the insects. The last bighorn disappeared from this region about 1912.

The bighorn of Lava Beds National Monument are of the species *Ovis canadensis californiana* and known by four common names: California bighorn, lava beds bighorn, rimrock bighorn and mountain sheep. In this region, the name California bighorn is prevalent. In California the species is now very rare and about ten percent of the state's total population of about two hundred is in the Monument's 1,100 acre fenced enclosure. Their historic North American range outside Alaska was once widespread.

RANGE OF BIGHORN IN NORTH AMERICA OUTSIDE ALASKA

The historic range of California bighorn, as shown on the map on page 6, covered from central British Columbia southward along a narrow band to the Mount Whitney area of California. They are now present in this range in only very widely scattered herds in remote

areas. Large areas within this range have probably remained unoccupied by bighorn for many centuries. Only now are herds starting to become reestablished through efforts of state and federal conservation agencies and hard working private wildlife groups.

Outlined on the map are the historic ranges of America's seven races of bighorn prior to pioneer settlement of the West. The following legend presents in order: (1) the full scientific name of genus, species and race, (2) the last name of the person who named it, (3) the date in which it was finally confirmed and officially catalogued as a new race, (4) the various common names by which it is known and (5) "type" refers to the specimen designated as the one on which the original description for the new race was based and where that animal was captured. The legend number for the species has been positioned on the map where the "type specimen" was taken.

Type specimens are usually saved and placed in natural history museums throughout America. This is done so that taxonomists, those who classify animals, may continue to study them and compare their features to new species and races that may turn up in the future. Sometimes such study establishes that an earlier classification was done inaccurately and that a name should be changed and updated as new knowledge is gained.

Use of scientific names, usually based upon Latin and Greek word roots, increases accuracy in classifying animals and in discussing them between scientists. While there may be dozens of common names for a species, there can be but one correct scientific name for it. This eliminates much confusion. When we use a scientific name like *Ovis canadensis californiana* everyone will know exactly which animal we mean.



MAP LEGEND

1. *Ovis canadensis californiana* Douglas, 1829; California, lava beds or rimrock bighorn or mountain sheep; type from near Mount Adams in Yakima Country, Washington.

2. *Ovis canadensis canadensis* Shaw, 1804; Rocky Mountain or Canada bighorn; type from mountains on Bow River near Exshaw, Alberta.

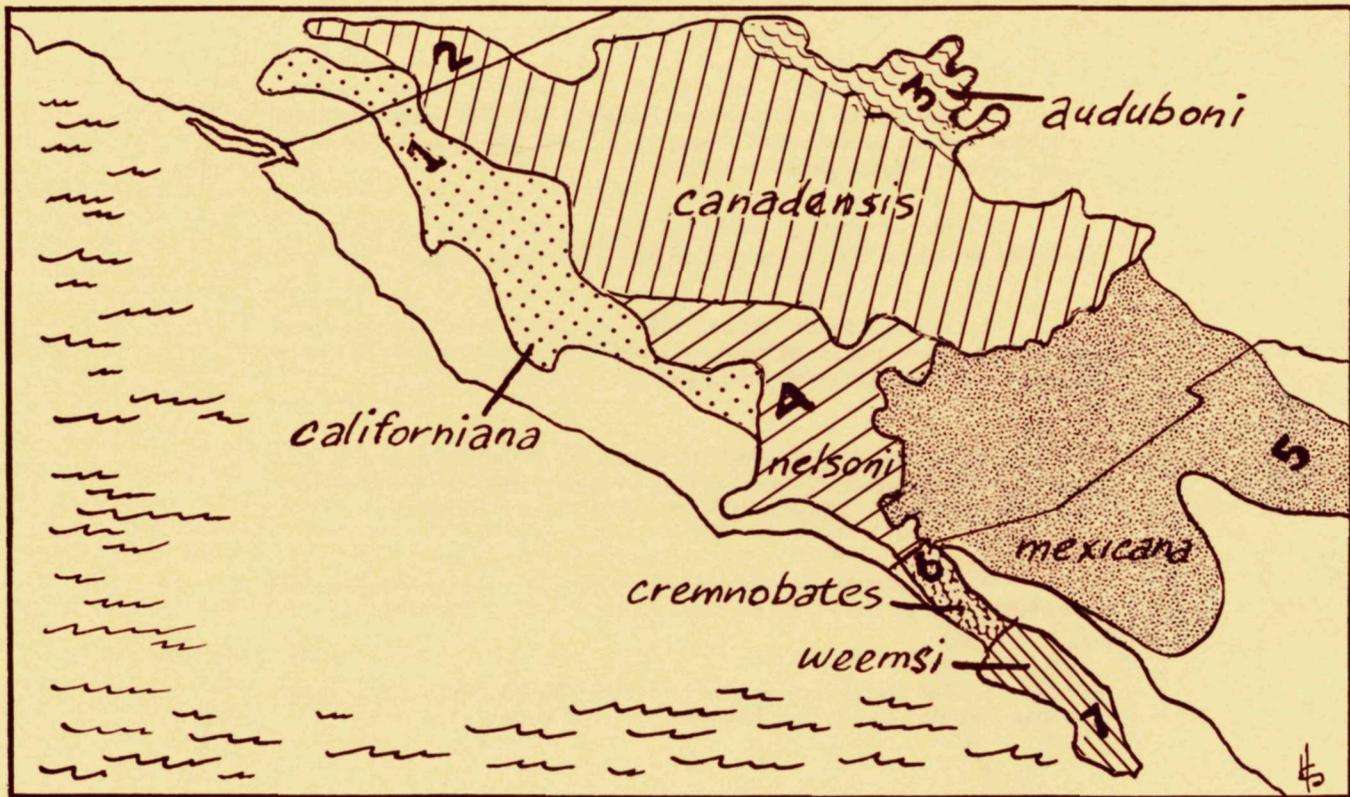
3. *Ovis canadensis auduboni* Merriam, 1901; Audubon or badlands bighorn; type from upper Missouri, probably from the badlands between Cheyenne and White Rivers in South Dakota. NOW EXTINCT.

4. *Ovis canadensis nelsoni* Merriam, 1897; Nelson bighorn or desert bighorn; type from about 5 miles south of Grapevine Peak on the boundary between Inyo County, California and Esmeralda County, Nevada.

5. *Ovis canadensis mexicana* Merriam, 1901; Mexican bighorn or desert bighorn; type from Lago de Santa Maria of Chihuahua, Mexico.

6. *Ovis canadensis cremnobates* Elliot, 1904; Peninsular bighorn; type from Mattomi, Sierra San Pedro Martir, Baja California, Mexico.

7. *Ovis canadensis weemsi* Goldman, 1937; Weems bighorn; type from Cajon de Tecomaja, Sierra de la Giganta of southern Baja California, Mexico.



Map adapted by permission of the Mountain Desert Bighorn Council.

SOURCE OF THE BIGHORN

Over the years zoologists, paleontologists and zoogeographers have sifted and evaluated animal fossils unearthed around the world and pieced together the story of how bighorn must have come to North America. During the last great ice age of the Pleistocene Epoch, about one or two million years ago, it is thought that ancestors of California bighorn migrated to the New World from Asia across a natural land bridge in the Bering Strait.

Today, the Bering Strait separates Russia and Alaska with 56 miles of cold arctic water. During the Pleistocene it must have had periodic upheavals of land and ice which formed a natural bridge connecting Old and New Worlds. The bridge would hold for centuries, then subside under the waves. It would lie submerged for centuries more, then rise again to serve as a migration route for animals seeking new territories. It may have been that primitive tribes also came to North America this way as they tracked and hunted the game that traveled before them. Some scientists theorize that the very source of man's ancient global trek began somewhere in Asia.

Those who study fossils think that all New World bighorn are related to ancestors of several forms of sheep found in the mountains and deserts of Eurasia, ranging from the Caucasus Mountains of Asia Minor northeastward through Tibet in Mongolia and on through eastern Russia.

Ancestors of today's bighorn probably crossed over the Bering land bridge from Siberia to Alaska. The migration must have taken many centuries and occurred in small herds representing different racial stocks. After a time they became well established in favorable Alaskan habitats and then moved south as climate warmed and ice melted. As these small herds grew in numbers and moved slowly southward for more centuries, they adapted to new environments and underwent subtle physical changes that we can today recognize as different species and races of bighorn.

Succeeding generations continued to show change as they adapted to different conditions in their northern and southern latitudes. Even isolated pockets of adjacent mountain ranges saw the development of new races as time passed. Today, we know of seven distinct races, or subspecies, of bighorn outside of Alaska. One of these seven, the Audubon bighorn of the Dakotas, is now extinct.



BIGHORN ADAPTATIONS

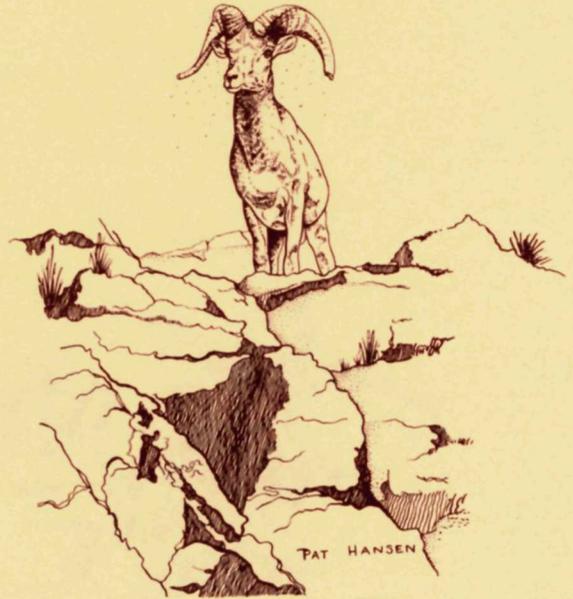
The Alaska sheep that did not migrate south adapted further to their more cold and harsh environment and evolved into a species distinct from the southern *Ovis canadensis*. The Alaskan species is the thinhorn sheep, *Ovis dalli* and there are three races of thinhorn in the north. The surest way that you can quickly tell the northern species from the southern is in the circumference of the horns on the rams. Thinhorn sheep have more slender horns while the bighorns' are thicker.

A recent theory advanced on the physiological function of horns and antlers, especially among sheep, deer, elk and moose, is that they may serve as thermoregulators of body temperature. The horns and antlers may act somewhat like "radiators" to rid the body of excess heat. In hotter climates it would be an adaptive advantage to have a mechanism like larger horns of sufficient surface area to aid in cooling the body. If this is true, bighorn would be better adapted for this more southern and warmer area of North America than thinhorn sheep would be.

Conversely, bighorn would not be as well adapted as thinhorn to cold Alaskan winters. Their larger horns would cause them to loose body heat and they would gradually freeze to death during periods of extreme cold. The theory is still inconclusive and under study, but it seems plausible as this is exactly the nature of animal adaptations: form has function. What do you think?

California bighorn thrive in this arid climate. They have evolved adaptations and behavior that fit them well for survival here. Like camels they can retain enough water to last for days at a time. To avoid dehydration in an environment limited in drinking water, bighorn physiologically alter their body temperatures and blood plasma viscosity. A special layer of fat and their pelage also insulate them to minimize loss of moisture by evaporation.

The day vision of bighorn is many times greater and sharper than human sight, but night vision is about equal to man's. Their senses of hearing and smell are also highly developed. They thus can detect danger approaching from the distance. They have spongy pads on their hooves to aid them in gripping the rocks they climb in their steep and rugged habitat. They also have adaptations of social significance. Special glands are used to leave scents behind on rocks and plants to attract other bighorn that may come into the area of a herd. The glands are located in the corners of the eyes (lacrimal glands) and between the splits in the hooves (inter-digital glands). All of these characteristics are important adaptations which give bighorn ecological advantages for survival in their habitat within Lava Beds National Monument.



LOOK FOR THE BIGHORN

You may see some of the Monument's bighorn during your stay. Scan the distant terrain with binoculars; they are most apt to be seen on the rugged lava rock slopes in small bands of six or more.

ON SAFETY. Visitors are welcome to view the bighorn from along the Monument road and the overlooks. For your own safety, and the safety of others, please do not block the travel lanes of the road while watching the sheep. Don't enter the enclosure or climb the fence, and watch out for rattlesnakes among the rocks and plants along the roadside.

Adult bighorn measure from thirty to thirty-nine inches tall at the shoulders, but mature rams may average about thirty-seven inches and ewes around thirty-four inches. A ram's front legs are usually about eighteen inches long and the chest about eighteen inches deep. In early summer, when they are in good flesh and fat from eating new vegetation growing in their habitat, you may see some very large rams weighing two hundred pounds or more. Throughout the rest of the year rams usually weigh about one hundred sixty pounds and ewes from one hundred to one hundred fifty.



Horns and skull alone may account for up to one sixth of the total weight of a large ram. Adult ram horns average thirty to forty inches long around the curl, twenty-two to twenty-six inches wide between the tips and from twelve to fourteen and one half inches in circumference around each base next to the skull. Horns of both ewes and rams are permanent; they are not shed annually as in the deer. The horns are a corneous sheath of keratin covering a bony core. Ram horns spiral around in a full graceful curl or some fraction of a full curl depending upon their age. Ewe horns are much thinner and shorter and curve gently backward only slightly. The longer horns denote the older animals.

In summer the coats, or pelage, of bighorn are dark brown while in winter their coats turn beige or yellowish. They have a white rump patch in the summer. Throughout the year they tend to blend well into the colors of their habitat, sometimes making it hard to spot them. The skin is black, but you are not apt to see any exposed as it is generally covered by hair and fleece. Body hair is from one inch to an inch and one half long and fleece is about one half inch deep. Keep your eyes sharp and focused on the distant landscape. Look for them every so often during the day. You may see them out there; they are back in their old haunts in the lava beds.



BREEDING BEHAVIOR

October and November is breeding season for bighorn in the Monument. It is the time of battle for rams as they fight for possession of the ewes. There is much activity on the slopes during this period and you may see ewes and rams moving about in five characteristic gaits: the walk, the trot, the run, the stiff-legged bound and the pompous or alarmed walk.

The rut, or time of mating, is all out war between rival rams. Two will pair off, face each other in challenge, and rise up on their hind legs and charge full force. Each tries to knock the other off balance as they butt their horns together. When they strike you may hear the loud "crack" for a mile or more. Rarely do these fights result in death to one of the males. At most, a horn is broken off at the tip or some hide is nipped away. The loser usually admits defeat before there is serious injury and humbly withdraws, leaving the ewes to the proud and haughty victor.

This duel at rutting time is a behavioral adaptation that is beneficial to the herd. It insures that lambs will be sired by the strongest and healthiest rams. It is nature's way of making sure that lambs born the following spring will be the strongest possible.



FUTURE OF THE BIGHORN

Lambs are the bighorns' future. Each new lamb is one more step toward reestablishing a healthy herd of resident bighorns in the Monument. Progress of the current wildlife management plan is measured in terms of the number of new lambs born every spring and surviving to grow and reproduce. Wildlife scientists are especially watchful and protective during lambing time in the lava beds.

After rut and breeding during late fall, ewes carry the developing lambs for six full months. Here in the Monument they are born in either April or May depending upon the season of rut. At birth the lambs are cleaned up and quickly hidden by their mothers to get them out of sight of predators like coyotes, golden eagles, bobcats and cougars.

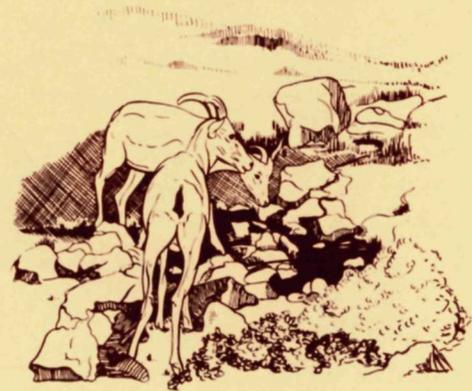




A newborn lamb may weigh seven or eight pounds. In only a few minutes after birth it will be up and walking; a little unsteadily at first, but it learns very quickly. About four months later they are weaned and fending for themselves by nibbling on vegetation that will comprise their diets for the remainder of their lives. Perennial grasses are preferred, supplemented by some larger shrubby browse plants and annual grasses and forbs. Ewes are protective of their lambs and band together to share the "babysitting chores." There is social organization among a group of ewes with their lambs. You may be fortunate to view some idyllic scenes, some of them a little comical.

At times one or two ewes will take charge of seven or eight lambs while the other ewes wander off searching for food and water. Unconcerned, and in the best of adolescent traditions, the lambs will invariably romp and play much like domestic lambs. They chase each other, play "king of the mountain" and jump about friskily, sometimes turning complete flips in midair.

As a lamb grows and fills out, the color of its eyes change. The eyes of all young lambs are uniformly dark and appear to be almost black. A lamb four months of age still retains the dark eyes. A yearling ewe will still carry a trace of darkness, although the eye is predominantly golden. A ewe of two years comes finally to possess the typical golden eye of all adults.



THE PLAN FOR BRINGING BACK THE BIGHORN

Since establishment of the National Park Service in 1916, protection of America's natural resources has been one of its major responsibilities. In early days the primary concern was to protect pristine lands that had come unaltered and intact into the Park system. In recent years, lands of national significance that had felt the hand of modern man have also been incorporated.

These additional lands had undergone alteration in their ecological makeup, but they still held significant potential for restoration when carefully studied and managed by the National Park Service. The lands had a long history of abuse by modern man. They were overgrazed by livestock; his stock had added further problems by carrying in diseases which decimated native wildlife populations. The timber on many lands had been severely overcut and on some exotic plants had been introduced which dominated the native vegetation. Fire, or the lack of it, had changed still other lands.

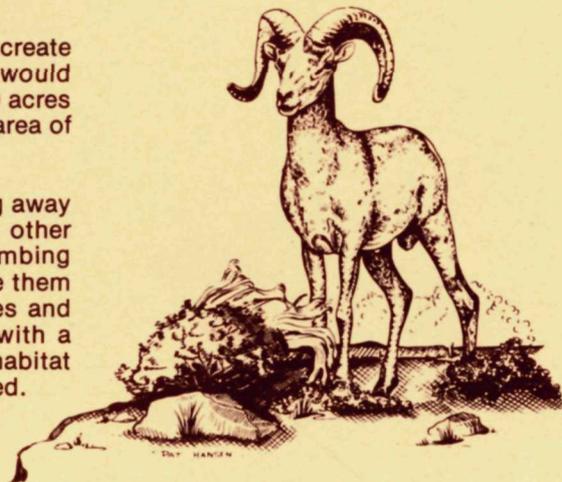
Man had caused too many fires to occur on some lands that had had a history of only occasional burns. On others, he controlled outbreak of fire where the community had evolved in the presence of numerous natural burns over the years. His tampering with the natural evolutionary history of the ecosystems on these lands had made man unwittingly directly responsible for habitat destruction, and consequently for serious declines in native wildlife populations.

In 1962 the Secretary of the Interior formed a special committee of prominent wildlife scientists to study and formulate suitable management procedures for restoring native wildlife to the altered lands. Known as the Leopold Committee, the scientists worked for a year on this complex problem. At the end of the year they set down their recommendations in a report for the National Park Service. The superintendents of the parks then used the information to shape plans for restoration of wildlife on lands over which they had jurisdiction.

The Leopold Committee had recommended that California bighorn be restored to Lava Beds National Monument. Plans to accomplish this task were begun in 1966. In the reestablishment program developed, coordination and sharing of responsibilities were worked out by five cooperating agencies: the National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Bureau of Land Management and the California Department of Fish and Game.

Construction work was begun as soon as possible to create optimum conditions of habitat for the bighorn transplants that would soon be brought into the Monument. A fenced enclosure of 1,100 acres was built in 1971 to restrict the movements of the bighorn to the area of the Monument that held the best habitat available.

The enclosure would keep the bighorn from wandering away and isolate them from human pressures and competition with other grazing animals such as domestic livestock and deer. During lambing time it would also be critical to the productivity of the herd to give them a feeling of privacy and isolation to minimize stress on the ewes and their offspring. The enclosure would also provide the bighorn with a range that could be controlled by wildlife scientists so that habitat carrying capacity for the herd could be monitored and maintained.



No natural water sources were available in the area selected for the enclosure so water had to be introduced. Three water collection and storage systems, known as "guzzlers," were built for permanent and year around water supply for the herd. The fence was ready; the best habitat was set aside and protected; water sources were established. By the fall of 1971 we were ready to bring back the bighorn.

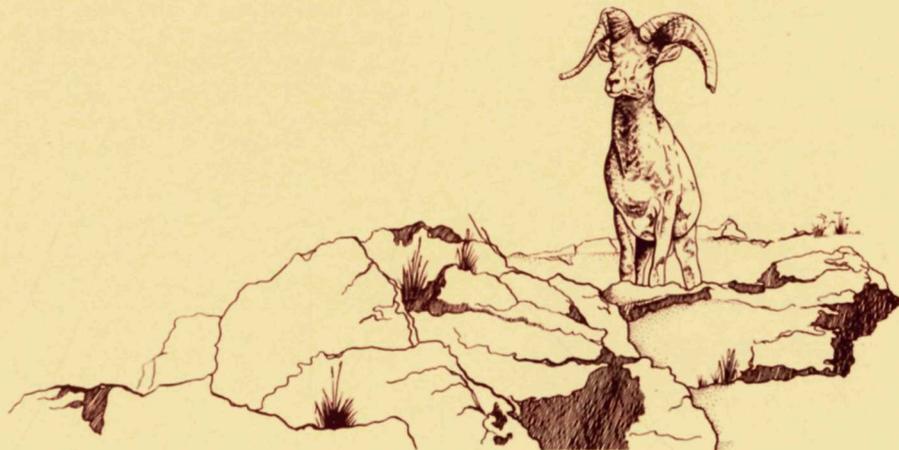
In October of 1971 two California bighorn rams and eight ewes were brought to the Monument and released in the enclosure. They had been trapped in the wild near Williams Lake, British Columbia and trucked here by the California Department of Fish and Game with the cooperation of the Canadian Province of British Columbia. In a mindless poaching incident in 1973, two adult rams were shot during the breeding season. A replacement ram was immediately obtained from the Charles Sheldon National Antelope Range in Nevada.

During the first three years of the project, up to the spring of 1974, seventeen lambs were born and herd size increased to a high of twenty-two sheep. Unfortunately, in the same year bluetongue disease struck the herd and numbers fell to only fifteen. Six bighorn of both sexes and several ages were among the fatalities. Bluetongue is a disease transmitted to wild animals by a small gnat that acts as a vector, carrying a virus from domestic livestock that graze the surrounding range.

Since transplanting the bighorn in 1971, reproduction and lamb survival have been generally good. According to the five agency agreement worked out, the plan is to allow the herd to increase to twenty-five breeding ewes and five breeding rams. When this population is reached, excess animals will then be available for transplanting to other northeastern California areas which have suitable habitat conditions for bighorn.

The bighorn program has proven to be one of the most popular wildlife projects ever undertaken in this area. It has caught the interest of conservation-minded people throughout America and Canada. We hope our success will continue and that setbacks will be minor. We feel that we have been instrumental in working to save the bighorn and increasing their numbers in California. It is the first step, we know, in returning the bighorn to their former range in this part of the world.

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This publication is the result of a research study on a federal area for which the National Park Service has total management responsibility. Its objective is to make the results of such studies available to park visitors in an easily understood form.



As the Nation's principle conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department for Natural Resources." The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States — now and in the future.