

Mountain Sheep Restoration Through Private/Public Partnership

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The mountain sheep (*Ovis canadensis*) is one of the most prized big game species in North America. It is difficult to examine these animals in their habitat without being amazed that they are able to survive in the barren areas that many of them use. But mountain sheep in North America have declined from more than 500,000 in pristine times (Seton 1929; Valdez 1988) to 185,000 in the 1990s (Valdez and Krausman 1999). Moreover, there are fewer than 20,000 desert bighorn sheep in the contiguous United States and several populations are state and federally listed as endangered (such as the peninsular mountain sheep, *O. c. cremnobates*).

Mountain sheep are charismatic. They have a high value to society as a wilderness species and they are a challenging animal to study. One way to determine the social value of a resource is to examine how much someone is willing to pay for an opportunity to use it. Since the 1980s, for example, the Foundation for North American Wild Sheep and state and provincial agencies have auctioned permits for the opportunity to hunt sheep in some western states, Canadian provinces, and in Mexico. The millions of dollars generated from the auction are used for sheep management and research (Table 11.1). Most of this money constitutes the basic budget for sheep management and is used to capture, translocate, and restore mountain sheep to historic range.

Table 11.1. The Maximum Dollar Amount Generated from Auction of a Single Mountain Sheep Permit

<i>Area</i>	<i>Amount paid for 1 permit</i>
Alberta, Canada	\$405,000
Tiburón Island, Mexico	200,000
North Dakota	47,500
Wyoming	55,000
Colorado	56,000
Utah	72,000
Texas	77,000
Nevada	79,000
Washington	100,000
Idaho	101,000
California	110,000
Oregon	110,000
New Mexico	123,000
Arizona	303,000
Montana	310,000

Mountain sheep populations have declined for an array of human-related reasons (hunting, habitat alteration, competition with livestock) and have made the transition from a locally common species to one of the rarest ungulates in North America (Valdez and Krausman 1999). An entire subspecies, the Audubon or Badlands bighorn (*O. c. auduboni*), which inhabited areas along the Yellowstone and Missouri rivers in eastern Montana, eastern Wyoming, western North and South Dakota, and northwestern Nebraska, has been extirpated. Rocky Mountain (*O. c. canadensis*), California (*O. c. californiana*), and desert races of mountain sheep were also eliminated in parts of their range in the United States and Mexico. The major decline of mountain sheep populations occurred during the latter half of the nineteenth century due to disease transmission from livestock. Heavy grazing in northwestern Mexico and the southwestern United States also occurred in the early 1800s (Holechek et al. 1995).

One successful approach to the restoration of large mammals has been to translocate them into former habitats. In the early 1900s, large mammals were at an all-time low in North America. This situation led to concern by conservationists and politicians that led in turn to North America's early restoration efforts. The history of big game conservation has come in three

stages. The first stage occurred when Europeans first arrived in North America: there was little concern for the abundant wildlife; exploitation was the norm. The second stage was realization that this wanton exploitation would cause the demise of large mammals; efforts were initiated to protect the remaining stock. In the third stage, widespread conservation efforts have led to the rise of wildlife restoration and scientific management of this public resource (Mackie 2000). This conservation philosophy includes translocation as a restoration tool.

In 1878, sportsmen translocated 18 white-tailed deer (*Odocoileus virginianus*) from New York to Vermont and ushered in a century of U.S. big game restoration (Mackie 2000). Several years later, in 1892, elk (*Cervus elaphus*) from Yellowstone National Park became the focus of trapping and translocating that helped reestablish elk populations over North America. The translocation of other large mammals followed, but the scientific basis for translocations was not developed until the advent of wildlife management in the 1920s and 1930s (Leopold 1933). Regardless of the rationale behind reestablishing large mammals, such translocations are time consuming, expensive, and logistically and politically challenging (Wolf et al. 1996; Dunham 1997; Fritts et al. 1997). Although guidelines for translocating animals are available (Rowland and Schmidt 1981; IUCN 1995; Wolfe et al. 1996), the successes and failures of many translocations are poorly documented (Short et al. 1992), translocation techniques are rarely tested (Morgart and Krausman 1981; Thompson et al. 2001), and many projects are based partly or even entirely on untested concepts (Hein 1997). At best, North American big game restoration has followed the rather nebulous model of "adaptive management."

Early translocations of mountain sheep suffered from methodological problems such as using padded steel leghold traps. With the advent of the net gun, drop net, safe anesthetizing drugs, and the use of helicopters, however, mountain sheep capture and transport have become more practical. From 1954 to 1978, some 153 mountain sheep in deserts were successfully trapped and translocated. Over the two decades since then, this number has increased by an order of magnitude to more than 2,000 translocations. Although mountain sheep translocations have become commonplace (Bailey 1990; Jessup et al. 1995), most restoration programs have not been successful (Risenhoover et al. 1988). Only 53 percent of 87 translocated populations in nine western states succeeded in the 1980s (Leslie 1980), for example, and only 41 of 100 translocations succeeded in six states between 1923 to 1997 (Singer et al. 2000). Some efforts have succeeded in returning mountain sheep to vacant ranges (Buechner 1960; Trefethen 1975), however, where at least 200 translocations have been made (Bailey and Klein 1997).

Clearly, great effort has gone into restoring mountain sheep populations in the western United States. Numerous state, federal, and private organizations (the Arizona Desert Bighorn Sheep Society, Bighorn Institute, Bighorns Unlimited, Boone and Crockett Club, national and state chapters of the Foundation for North American Wild Sheep, Fraternity of the Desert Bighorn, Grand Slam Club, Rocky Mountain Bighorn Sheep Society, Society for the Conservation of Bighorn Sheep, Texas Bighorn Society, Wild Sheep Society of British Columbia) have supplied financial contributions and labor. And much of this support has been matched with federal funds, especially where restoration has occurred on state or federal land with public access. Despite the deep involvement of the private sector in mountain sheep restoration, most translocations have occurred on public land. This is most likely a reflection of the U.S. policy that recognizes free-ranging wildlife as a public resource. Although private landowners in Sonora, Mexico, are actively involved in wild sheep conservation and translocation (Valdez 1997), placing public resources on private land is not the norm in the United States. In 1985, for example, there were 51 translocations of large indigenous mammals in the United States: 48 were on state and federal property whereas only 3 were on private lands (Nielsen and Brown 1988). We believe that mountain sheep restoration can be furthered through partnerships between the private and public sectors—a model approach that could expand restoration opportunities for mountain sheep. This chapter examines the largest private-land translocation project in New Mexico and evaluates the potential benefits of private involvement to mountain sheep restoration.

Study Area

The transplant occurred in the Fra Cristobal Mountains of Sierra and Socorro counties, New Mexico, 32 km northeast of Truth or Consequences. The mountains are part of the Armendaris Ranch owned by Ted Turner's New Mexico Ranch Properties, Inc. (NMRPI). The mountain range varies from 5 to 8 km wide, is 24 km long, and is 1493 to 2282 m in elevation. The ranch and surrounding area are part of the Upper Chihuahuan Life Zone. Precipitation averages 20.7 cm annually; 68 percent of the rain occurs from May through September (Brown 1982). Water sources include five reservoirs capable of storing 19,000 liters and several rock impressions capable of holding 200 liters. Vegetation consists of Chihuahuan Desert scrub, desert grassland, montane scrub, coniferous woodland, sand scrub, and riparian species (Miller 1999).

Like mountain sheep throughout the West, those in New Mexico were

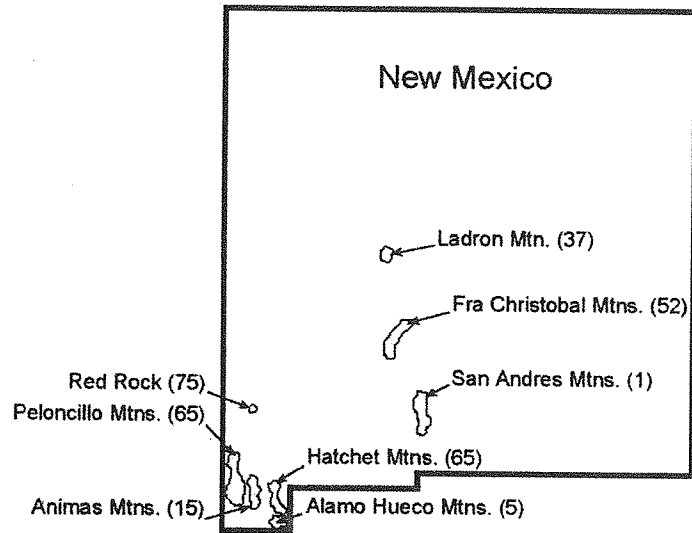


Figure 11.1. Location of desert races of mountain sheep in New Mexico and approximate population size in 2000.

once widespread and inhabited at least 14 mountain ranges. By 1955, however, only two populations existed in the San Andres and Big Hatchet mountains. The population in the San Andres Mountains was reduced to a single female by the year 2000 and the Big Hatchet Mountains now contain fewer than 60 animals. Six other translocated populations number fewer than 80 each (Figure 11.1). The desert population of mountain sheep was listed as endangered in New Mexico in 1980.

The San Andres Mountains supported the largest herd of wild sheep in the state (Hoban 1990) until they were reduced by disease and predation (Rominger and Weisenberger 1999). Other mountain ranges are relatively small, and mountain sheep population growth is static. A translocation was scheduled for the Caballo Mountains (adjacent to the Fra Cristobal Mountains in central New Mexico), but local opposition ended the plans for this mountain sheep restoration (Pederson 1996). The People for the Preservation of the Caballo Mountains (a citizens group in Truth or Consequences) opposed the transplant because they thought it would eliminate human access to the mountain (Pederson 1996). Because the Fra Cristobal Mountains provided potential habitat, were privately owned, and access was already limited, the public supported the translocation there. The decision was in favor of the sheep, not politics, and was supported by an array of concerned citizens—among them the Southwest Consolidated Sportsmen, Safari Club

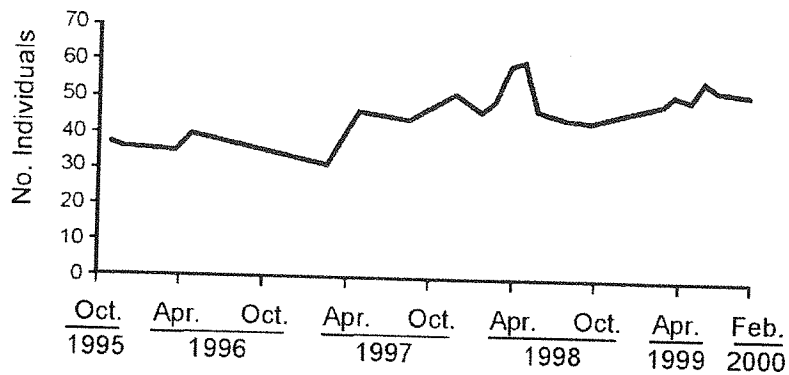


Figure 11.2. Population of mountain sheep in the Fra Cristobal Mountains, New Mexico (1995–2000).

International, Foundation for North American Wild Sheep, Animas Foundation, Southwest Center for Biodiversity, Southwest Environmental Center, and Preservation of Caballo Mountains, Inc. (Pederson 1996). Because the success or failure of restoration efforts is determined by the public (particularly those in decision-making and public-contact positions charged with recovery), the importance of people can become limiting factors in the survival of species (Maehr 1998). It was in the hope that such constraints would be removed that an effort was made to restore mountain sheep to the Fra Cristobal Mountains.

Thirty-seven sheep (24 females, 13 males) were translocated from Red Rock in southwestern New Mexico to the Fra Cristobal Mountains on 25 and 26 October 1995. Seven additional males were translocated from Red Rock in 1997. Red Rock is an enclosure established as a breeding facility where mountain sheep are raised and then translocated throughout vacant habitat in New Mexico. In February 2000 the Fra Cristobal Mountains contained 52 adult and yearling mountain sheep (22 adult females, 18 adult males, 6 yearling females, 6 yearling males) (Figure 11.2).

In New Mexico, income from hunting does not offset the costs of mountain sheep management. Thus private/public partnerships may be instrumental to future mountain sheep restoration work. Ted Turner created the Turner Endangered Species Fund (TESF) in June 1997 to conserve biodiversity by ensuring the persistence of imperiled species and their habitat. Because Turner's NMRPI has a strong commitment to reestablishing native, extirpated, and endangered species, a memorandum of understanding between NMRPI and the New Mexico Department of Game and Fish (NMDGF) was developed to further this work. The memorandum of under-

standing was designed to allow NMRPI to reestablish a viable self-sustaining mountain sheep population in the privately owned Fra Cristobal Mountains. Once the population exceeds 100 animals, the surplus can be used in other translocation efforts throughout the state and some males could be hunted. The future of mountain sheep in New Mexico depends on the preservation and reoccupation of the isolated ranges that contain suitable habitat.

The Memorandum of Understanding

In 1995, NMDGF and NMRPI approved a plan to translocate mountain sheep into the Fra Cristobal Mountains with the intention of establishing a viable population. Both parties agreed to specific conditions. The New Mexico Department of Game and Fish agreed to:

1. Test all sheep before release (if requested by NMRPI) for diseases and vaccinate each mountain sheep against diseases to the extent that vaccines are available.
2. Make an initial release of disease-free mountain sheep into the Fra Cristobal Mountains in 1995.
3. Coordinate with NMRPI in the management of translocated mountain sheep and their offspring and conduct a postrelease study including population surveys.
4. Coordinate with NMRPI to write a management plan for a minimum viable population that does not exceed carrying capacity.
5. Assume all financial costs associated with the capture, release, management, and monitoring during the restoration effort.
6. Set mountain sheep habitat utilization levels in conjunction with NMRPI.
7. Leave jurisdictional control of private land in the Fra Cristobal Mountains with NMRPI.

Although NMDGF agreed to assume financial responsibility for capture, release, management, and monitoring, many of these expenses have in fact been paid by TESH. In fact, TESH supported research, recaptured 16 female sheep, and hired a full-time biologist and several summer interns to monitor sheep in 1999. As well, TESH developed cooperative agreements with the University of Arizona and the University of California to study population dynamics and diseases of mountain sheep (Boyce et al. 1999). In 1999, a vet-

erinarian was added to the TESH staff. A cooperative agreement was also developed with the Hornocker Wildlife Institute to assess mountain lion impacts on the translocated mountain sheep. Furthermore, TESH and NMDGF paid the Conservation Breeding Specialist Group of the IUCN to conduct a population and habitat viability assessment workshop to assist New Mexico in defining priorities for mountain sheep restoration (Fisher et al. 1999). In all, TESH spent \$150,000 on sheep restoration efforts in New Mexico in 1999. Because of TESH and its research arrangements with universities and private organizations, NMDGF was able to direct precious funds and personnel to other pressing wildlife issues. The memorandum of understanding further stipulated that NMRPI agreed to:

1. Provide a site in the Fra Cristobal Mountains for mountain sheep translocation.
2. Permit construction and maintenance of water catchments as needed and determined by NMRPI.
3. Prohibit grazing of domestic sheep and goats in the Fra Cristobal Mountains.
4. Set mountain sheep habitat utilization levels in conjunction with NMDGF.
5. Acknowledge that the State Game Commission has jurisdictional control of the mountain sheep.

The memorandum of understanding also allowed mountain sheep to be translocated elsewhere if the population in the Fra Cristobal Mountains could sustain removals as determined by NMDGF. Moreover, NMRPI would afford NMDGF limited access to the Fra Cristobal Mountains. Access was provided for translocating sheep to or from the Fra Cristobal Mountains, handling dead or diseased mountain sheep, retrieving or replacing radio collars, and monitoring and surveying mountain sheep. NMRPI also provided reasonable access to wildlife interest groups for educational viewing of mountain sheep.

Results and Discussion

Although it is too early to determine the success of the transplant of mountain sheep into the Fra Cristobal Mountains, the cooperative venture between the state and NMRPI has certainly been viewed as a success by both parties. Since 1995 the population of mountain sheep in the Fra Cristobal Mountains is the only population in New Mexico that has grown. Further, it

has moved New Mexico closer to removing mountain sheep from the state's endangered status list and could serve as a source for future translocations. If population growth continues, the population may also provide future hunting opportunities—a situation that may create additional revenue for wildlife restoration efforts. Biologists with NMDGF believe that the Fra Cristobal Mountains can support up to 100 sheep. Furthermore, the public supported placing their wildlife resources on private land because that land had uncontested habitat for mountain sheep.

For mountain sheep in New Mexico to be downlisted from endangered to threatened, there must be at least 500 free-roaming sheep in the state with more than 100 in two different areas. To be removed from either list, another metapopulation of 100 must be established (NMDGF 1995). The cooperation between NMDGF and NMRPI has the potential to make their model of mountain sheep restoration a new paradigm for wildlife conservation through private/public partnerships—exceeding the expectations of national strategy sessions conducted decades ago (Brenneman and Bates 1984; Montana Land Reliance and Land Trust Exchange 1982).

The advantages of the private/public partnerships as exemplified by New Mexico mountain sheep restoration differ from those offered by traditional state or federal wildlife management programs. Most notably, the public does not have the opportunity to freely observe animals or utilize them until a huntable population is established. Even then, the number of hunters and other viewers would be limited to only a few. But the benefits to the public are significant. The private landowner has the opportunity to strengthen conservation programs by offering habitat for wildlife that otherwise would not be available and can serve as the nucleus for population expansion by natural colonization and future translocation. Furthermore, the private sector can act as a catalyst to translocation programs when an agency's will is weak and its resources are limited. In the case history presented here, mountain sheep would not have been translocated without private assistance. Although organizations such as TESH can bring considerable financial and real estate resources to restoration programs, the state and federal agencies must be the horse that pulls the buggy because they maintain the long-term view and have the resources to keep programs going. Moreover, changes in landownership patterns may annul a cooperative agreement. The commitments of individuals may change, but state and federal wildlife agencies have a mandate from the public for long-term management.

When TESH completes its planned activities for mountain sheep in the Fra Cristobal Mountains in 2002, it will have accomplished a translocation that has been monitored constantly and is documented with a solid database

from which informed decisions can be made. It will then be up to the state to continue the effort. Although private-sector cooperation has been called upon elsewhere to revive small populations such as the Florida panther (*Puma concolor coryi*) (Maehr 1998), success has seldom been achieved. The cooperative mix of public and private in mountain sheep restoration suggests that such efforts should be expanded both geographically and taxonomically.

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