

APPENDIX L

Specific Management Recommendations for Desert Bighorn Sheep

BIOLOGY AND SOCIAL BEHAVIOR

Desert bighorn sheep are social animals that associate in small groups most of the year. Larger groups are observed during August and September, which is the peak of the breeding season. Rams form bachelor groups after the breeding season and tend to use less rugged terrain and habitats not used by ewes and sub-adults, reducing competition for available resources (Bleich 1993).



Desert bighorn ewes typically breed when they are 2.5 years of age and give birth to one lamb after a gestation period of six months. The majority of lambs are born in February and March, although lambing may occur through July. The extended lambing season may be advantageous in the unpredictable desert environment in which adverse conditions could eliminate an entire lamb crop if they were produced in only one month. Adult ewes produce a single lamb and twinning is extremely rare which makes their reproductive potential low; however, bighorn sheep are long-lived, which may compensate for their low reproductive rate. Bighorn sheep surviving their first year often reach 10-12 years of age (Turner and Hansen 1980).

Bighorn sheep transfer home range knowledge from one generation to the next and rarely re-colonize ranges where they have been extirpated. Rams may naturally move long distances between mountain ranges in search of ewes during breeding season, and normally return to their natal home if they do not locate other bighorns. Ewes rarely follow rams on these journeys (Geist 1971). Therefore, transplants are necessary to establish populations in new areas. Some transplanted bighorn sheep are highly exploratory and may establish metapopulations through intermountain movements. Metapopulations are defined as populations of bighorns which may be widely separated and inhabit separate mountain ranges; however, interchange occurs because of exploratory movements of individuals and are considered as part of a larger population. The Sierra Diablo/Baylor/Beach Mountains are a system of interchanging bighorn populations or metapopulation as described by Hanski and Gilpin (1991). These movements may re-establish patterns that were previously lost when populations were

extirpated. The designation of the Sierra Diablo/Baylor/Beach Mountains metapopulation of bighorn sheep is a logical approach for managing the long-term viability of this population. This approach recognizes the importance of intermountain areas providing for interchange of individuals between populations and the potential for colonizing vacant habitats. Management of movement corridors between populations is critical to ensure the long-term persistence of desert bighorn sheep and will entail greater coordination between agencies and landowners for management of single populations (Bleich et al. 1990, Bailey 1992).

One hundred bighorn within a population or metapopulation is considered the minimum number for long-term survival based on Berger's (1990) analysis that populations of this size persisted up to seventy years. Smaller populations are more vulnerable to extinction than are large populations. However, recent information indicates that many populations numbering less than fifty have survived for more than fifty years. Wehausen (1995) suggests that populations of this size may be worth establishing, especially if they are part of a larger metapopulation.

HABITAT REQUIREMENTS



The most important habitat requirement of desert bighorn sheep is open, mountainous or canyon habitats close to escape terrain (cliffs of 60% slope or greater). Bighorn rely on keen eyesight and open terrain to detect predators and elude them by fleeing to escape terrain. Escape terrain is particularly important for ewes when lambing and rearing young. Rams will use denser vegetation and stray further from escape terrain than will maternal groups. The amount of habitat available to bighorn sheep is ultimately determined by the amount of escape terrain close to open landscapes (McCarty and Bailey 1994).

Shrubs dominate the diet of desert bighorn in the Chihuahuan Desert of Texas. However, bighorn consume a wide range of plants and vary their selection based on the most nutritious plants available seasonally. Bighorn favor newly emergent grasses and forbs during the summer-fall rainy season whereas use of shrubs is greatest in winter and early spring as grass quality declines. The quality and diversity of available plants are considered important to desert bighorn sheep (Sandoval 1979, Bavin 1982, and Elenowitz 1983).

Water is used year-round by desert bighorn sheep. Although some indigenous populations may have depended solely upon ephemeral water sources and succulent plants, water is readily used when provided and is an important factor in the selection of home ranges (McCarty and Bailey 1994).

IMPACTS

Domestic sheep and goats

Abundant evidence implicates domestic sheep as one cause of bighorn declines and

localized population extinctions from historical times to present. These domestics and their feral relatives use the same habitats as desert bighorn, compete for forage, and carry diseases that are lethal to desert sheep (Foreyth and Jessup 1982, Jessup 1985, McCarty and Bailey 1994). Domestic goats are also considered a potential health threat to bighorn sheep. Although domestic sheep and goats do not occur in currently occupied bighorn range, the occurrence of feral animals are a constant concern.

Cattle

Bighorn sheep generally do not compete for forage with domestic cattle under normal grazing systems because bighorn tend to occupy rugged habitats that cattle avoid. Periodically, grazing areas may overlap. Bighorn may range into flats during the spring to obtain the earliest green forbs and cattle may range into rugged terrain not normally used if they cannot find enough forage in less rugged terrain. In contrast to domestic sheep, cattle have not been implicated in causing the die-off of bighorns, nor has disease transmission from cattle to bighorn been conclusively shown. Cattle do carry diseases that are believed to be transmissible to bighorn (Jessup 1985, McCarty and Bailey 1994).

Exotic Ungulates

Aoudad sheep (*Ammotragus lervia*) are occasionally sighted in desert bighorn habitats. The aoudad has a higher reproductive potential than bighorn sheep, the ability to subsist on lower quality forage, and a preference for habitat similar to that of bighorn (Seegmiller and Simpson 1979). Aoudads are socially aggressive when they encounter bighorn and have been observed to herd female bighorn. Aoudad are capable of moving extensive distances and may be potential reservoirs of parasites and diseases detrimental to desert bighorn and other ungulates. Their potential to transmit diseases to bighorn is unclear (McCarty and Bailey 1994). Forty-five aoudads were collected for sampling in Brewster County, Texas from 1985-1986. Serum samples tested positive for eleven diseases including epizootic hemorrhagic disease (EHD), bluetongue (BT), bovine viral diarrhea (BVD), visticular stomatitis virus, infectious bovine rhinotracheitis, bovine herpesvirus-1, brucellosis, leptospirosis, Q-fever, rocky mountain spotted fever, and lyme disease (Johnson 1986).

Deer

In most western states desert bighorn sheep generally do not compete for forage with mule deer because deer use less rugged terrain and more heavily vegetated areas than do desert bighorn. In Texas the habitats of desert sheep and mule deer often overlap, creating some potential for forage competition during extended dry periods. Mule deer will share watering holes and mineral licks with bighorn sheep, and could be a potential source of disease. Water facilities developed for bighorn sheep in areas previously devoid of water may encourage deer use of bighorn habitat (Smith and Krausman 1988).

Predators

The mountain lion is the principal predator of bighorn sheep in Texas. Bighorn are also potential prey for coyotes, bobcats, black bears, and golden eagles. Predation is not considered a limiting factor in large, free-ranging populations. However, predation can be a significant mortality factor in fenced, recently introduced, or small populations (Wehausen 1992). Additionally, populations that habitually use habitat far from escape terrain or in dense vegetative cover are more vulnerable to predation (McQuivey 1978). Currently, the Texas Parks and Wildlife Department (TPWD) selectively removes predators from state-owned bighorn sheep ranges.

Fire Suppression

The suppression of fire over the last 100 years has allowed shrubs and stands of pinyon-juniper to encroach onto once open habitat, decreasing suitability for bighorns. Prescribed burns can be used to open more areas and increase the amount of suitable bighorn range (Wright and Bailey 1982).

Recreation

Desert bighorn by their nature are relatively intolerant of humans and the associated disturbances. Their flight distance increases in proportion to how secure they feel. Bighorn generally do not react to moving or parked vehicles and are not stressed by aircraft unless actively pursued. When bighorn are in escape terrain, they will tolerate people as close as 200 yards. If the bighorns are in less rugged terrain, they may flee when people are as far as a half mile away. Recreational use of bighorn habitat can be harmful, especially if the disturbance persists or occurs frequently. When bighorn are continually disturbed they may abandon habitat and water sources, resulting in decreased numbers and distribution (reviewed by McCarty and Bailey 1994). Lastly, increased recreational activity increases the potential for intentional human harassment and illegal kill. No use of llamas and goats as pack animals should be allowed in areas occupied by desert bighorn sheep, as there is potential for disease transmission.

Mining

Bighorn may temporarily abandon habitat while it is being mined, which could be critical if mining occurs on lambing grounds or near water sources. Roads for mining activities may provide access into previously undisturbed areas and increase potential negative impacts of people in bighorn habitat (McQuivey 1978).

Illegal Harvest

The relative impact of poaching on a population depends on the sex and numbers of animals taken. Illegal harvest of rams decreases the ram:ewe ratio and the availability of rams for future legal harvest. Additionally, black market trophy hunting may increase as populations increase in size and distribution.

Man-made Barriers

Barbed and net wire fences restrict movements and are a hazard to desert bighorn

sheep because they are poorly adapted for jumping and may die if they become entangled (Elenowitz 1983). Bighorns will readily cross two-lane roads that dissect their habitat, but four-lane highways may inhibit movement and cause higher mortality from accidents with vehicles. Housing developments also disrupt travel corridors, fragmenting use of desert mountain complexes by metapopulations. Isolation from human services currently limits housing development in most desert bighorn habitats. As the state's human population increases and traditional uses such as ranching potentially decline, urbanization will encroach further into desert bighorn habitat.

Disease

Desert bighorn are more susceptible to diseases and parasites than other native big game species. Bighorn are particularly susceptible to diseases carried by domestic sheep and typically develop bacterial pneumonia following contact (Jessup 1985, McCarty and Bailey 1994). This is the basis of strict guidelines for separating wild and domestic sheep adopted by the Bureau of Land Management (Desert Bighorn Council Technical Staff 1990).

In contrast to domestic sheep, cattle have not been implicated in the die-off of bighorn sheep nor has disease transmission from cattle to bighorn been conclusively proven. Cattle do carry diseases that are transmissible to bighorns (Jessup 1985, McCarty and Bailey 1994). Logically it follows that bighorns could be a potential source of infectious agents to cattle; there is no documentation of disease transmission to cattle. As a precaution, desert bighorn sheep are screened and tested for diseases before release from out of state to avoid introducing infectious agents into new areas.

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