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Status of Desert Bighorn in the Chihuahuan Desert Region

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ABSTRACT—Historically desert bighorn (*Ovis canadensis mexicana*) were found in widely scattered populations in most of the arid mountain ranges of the northern Chihuahuan Desert region. Exploited by early settlers, and later exposed to diseases of domestic sheep and goats, bighorn populations were extirpated throughout their Chihuahuan Desert range by the 1990s. Native Texas bighorns were extirpated by 1960 while New Mexico desert bighorns persisted into the 1990s. Desert bighorn persisted in the Mexican states of Chihuahua and Coahuila until at least the 1970s. Desert bighorn populations in the Arizona, Durango, and Nuevo Leon portions of the Chihuahuan Desert were limited and Arizona populations have been supplemented by transplants from Sonoran Desert populations. Current Chihuahuan Desert populations of desert bighorn reflect intense restoration efforts begun in 1956. Restoration efforts are underway in New Mexico and Texas under the direction of state wildlife agencies, and in Chihuahua and Coahuila largely by private efforts. The future of bighorn populations in the Chihuahuan Desert region looks much brighter than in 1974 as restoration continues. Some populations are stable or increasing under regulatory protection and limited harvest is taking place. However, threats to future success do exist.

RESUMEN—Historicamente el borrego cimarron del desierto (*Ovis canadensis mexicana*) se encontraba en poblaciones muy dispersas de la mayoria de las areas aridas y montanosas del norte de la region del desierto chihuahuense. Explotados por los primeros pobladores, y despues expuestos a las enfermendades de borregos y cabras domesticos, las poblaciones de borregos Cimarron del desierto fueron erradicadas en toda el area del desierto chihuahuense para los anos 90. Los borregos cimarrom natives de Texas fueron erradicados para 1960 mientras que los cimarrones del desierto de Nuevo Mexico continuaron hasta los anos de la decada de 1990. El Cimarron del desierto persisto en Chihuahua y Coahuila al menos hasta los anos 70. Las poblaciones de cimarrones del desierto en las porciones del Desierto de Chihuahua en los estodos de Arizona, Durango, y Nuevo Leon fueron limitadas y las poblaciones de Arizona han sido complementadas por transplantes de poblaciones del Desierto de Sonora. Las poblaciones actuales de borregos cimarrones del Desierto Chihuahuense reflejan intensos esfuerzos de restitucion que comenzaron in 1956. Los esfuerzos de restitucion estan avanzados en Nuevo Mexico y Texas bajo la direccion de agencies estatales de vida Silvestre, y en Chihuahua y Coahuila en gran parte por esfuerzos privados. El futuro de las poblaciones de cimarrones en la region del Desierto de Chihuahua se ve mucho major que in 1974 conforme continua la restitucion. Algunas poblaciones estan estables o incrementandose bajo proteccion reguladora y se esta llevando a cobo una recoleccion limitada. Sin embargo, si existen amenazas para un futuro exito.

Historical Status and Decline—Desert bighorn are native to rugged, arid mountain ranges in the southwestern U.S. and northwestern México (Monson 1980). Once found scattered throughout the Chihuahuan Desert region, this species experienced significant population declines beginning in the late 19th century (Monson 1980). Reasons for declines include habitat loss, disease, human disturbance, and unregulated harvest (Buechner 1960). Petroglyphs and pictographs depicting mountain sheep in El Paso and Hudspeth counties, Texas, at Three Rivers, New Mexico, and other locations, indicate prehistoric presence of bighorn in the Chihuahuan Desert region (Grant 1980).

While we may never know the true historical distribution of bighorn in the Chihuahuan Desert, populations are naturally found in scattered, often isolated mountain ranges. Records indicate desert bighorn were found from as far north as central New Mexico, south to northern Durango, west to southeastern Arizona, and as far east as northern Coahuila and western Nuevo Leon (Monson 1980). The type locality for the subspecies is in northwestern Chihuahua, at Lago Santa Maria (Valdez and Krausman 1999). Leopold (1959) presented a map of their past distribution in México.

Hailey (1974) presented the current status of desert bighorn in the Chihuahuan Desert at the first symposium on the biological resources of the Chihuahuan Desert region of the United States and México. Things have changed dramatically in the past 30 years, in ways Hailey may not have been able to imagine at the time. In 1974, the future was uncertain, but hopes were high for the success of future restoration efforts. Hailey (1974) did not report details of populations in México or New Mexico; restoration was underway in Texas, data were lacking for México, and the only viable Chihuahuan Desert population, estimated at 350 head, was in south-central New Mexico's San Andres Mountains.

Bighorn persisted in Chihuahua and Coahuila until the 1970s (A. Espinosa, pers. comm., CEMEX, Monterrey, México) but data on past distribution are unclear (Baker 1956; Hall and Kelson 1959; Leopold 1959; Davila 1960; Arellano 1961; Trefethen 1975; Monson 1980; Hall 1981; Tarango and Krausman 1997; Valdez and Krausman 1999). Data on historic distribution of desert bighorn in Coahuila are only now becoming available and bighorn are thought to have formerly inhabited 14 mountain ranges within this state (A. Espinosa, pers. comm., CEMEX, Monterrey, México). No data exist on dates of extirpation in Durango and Nuevo Leon, or accurate historical bighorn distribution in these states.

In New Mexico, desert bighorn were historically found in most arid mountain ranges in the southern half of the state, including the Guadalupe, San Andres, Peloncillo, and

Big Hatchet mountains (Gordon 1957). By 1957, only two populations were extant—in the Big Hatchet and San Andres ranges—and drought was taking its toll (Gordon 1957). The largest historical populations may have been found in the Guadalupe and San Andres ranges. The Guadalupe Mountains population, considered extirpated by the 1940s, was impacted by the introduction of domestic sheep and goats, and unregulated harvest (Gross 1960). The San Andres Mountains population was down to 33 individuals in 1941, when the San Andres National Wildlife Refuge (NWR) was established (Hoban 1990). This population grew to approximately 350 animals by the mid-1970s (Montoya and Munoz 1976). However, this herd experienced a widespread scabies epizootic in 1978 and 1979 and had declined to an estimated 80 individuals by November 1979 (Lange et al. 1980; Hoban 1990). Between 1982 and 1994 the herd fluctuated between 25 to 35 head, until drought induced poor range conditions and mountain lion (*Puma concolor*) predation drove the population down to a single animal in 1997 (Goldstein and Rominger 2003).

Early population estimates for Texas in the 1880s have been placed between 1,000 and 1,500 head (Kilpatric 1982), based upon an estimate made by an early rancher near Van Horn (Carson 1941; Cook 1994). The first scientific evaluation of Texas' desert bighorn herd was presented by Vernon Bailey (1905) who worked in Texas from 1889 to 1905, and while he did not provide an estimate, it is generally agreed that the population was around 500 (Cook 1994). Bailey (1905) expressed concern over the future of the Texas desert bighorn population and hoped his report would be a catalyst for conservation efforts. Davis and Taylor (1939) reported on Texas desert bighorn and, following a brief survey, provided an estimate of 300, nearly all north of Van Horn, in Culberson County. At the time of Davis and Taylor's (1939) investigation into the status of bighorns in Texas, Burch Carson was working in Culberson County and he estimated 150 head in 1941 (Carson 1941), and four years later 75 or less in Texas (Carson 1945). Carson was the most knowledgeable person relative to the Texas herd in the late 1930s and 1940s and spent considerable time studying the species in its native habitat (Cook 1994).

The price of domestic fine wool doubled between 1939 and 1943, with the sharpest increase between 1940 and 1941 (Apodaca 1997). It was a profitable time to be in the domestic sheep business and the population of domestic sheep in Culberson County, the core of Texas' desert bighorn range, increased from 19 animals in 1939 (Davis and Taylor 1939) to approximately 20,000 animals two years later (Carson 1941). Besides competition for forage, this new agricultural enterprise brought domestic sheep disease and net wire fencing to the range, sounding a death knoll for native bighorns

(Kilpatric 1990). In 1945, the Sierra Diablo Wildlife Management Area (WMA) was established but no additional management was attempted and the last native Texas bighorn observation was made in 1958 (Kilpatric 1990). Desert bighorn in Texas were extirpated by the early 1960s (Kilpatric 1990), a short 80 years after Anglo settlement began in the region of desert bighorn range.

The subspecies *O. c. mexicana* was found throughout the Chihuahuan Desert region (Monson 1980) and while this subspecies currently inhabits the Sonoran Desert it became genetically extinct in the Chihuahuan Desert with the decimation of the San Andres herd by scabies. Some bighorn biologists consider this an important fact, demonstrating how fragile desert ecosystems can be, especially the Chihuahuan Desert. Overuse of natural resources by humans through mining, transportation routes, unregulated harvest, and domestic livestock grazing, decimated the region's bighorn population within 110 years (1880 to 1990s). What genetic or behavioral differences may have been present in Chihuahuan Desert populations will never be known.

Restoration Efforts—Restoration of desert bighorn in the Chihuahuan Desert region began as early as the 1950s in Texas, with cooperation from the state of Arizona, the United States Fish and Wildlife Service, and others (Hailey 1974). New Mexico began active restoration of desert bighorn in 1972 when the Red Rock WMA was established (Montoya and Munoz 1976). Efforts are currently underway in both Chihuahua (Uranga-Thomas 2001) and Coahuila (Sandoval and Espinosa T. 2001). The Desert Bighorn Recovery Program, established by CEMEX and the Unidos Para La Conservacion y Agrupacion Sierra Madre, has the objective of re-establishing desert bighorn into suitable mountains of northern México (A. Espinosa, pers. comm., CEMEX, Monterrey, México). The Pilares breeding facility at Ocampo, Coahuila is currently using brood stock from Sonora in an effort to raise suitable numbers of desert bighorn for release into their native habitat (A. Espinosa, pers. comm, CEMEX Monterrey, México). Starting with four individuals from Sonora augmented with 25 additional bighorn in 2002 and 2003, restoration efforts in northern Chihuahua accounted for 39 bighorn in a brood facility in September, 2004 (R. Uranga-Thomas, pers. comm., Chihuahua Bighorn Sheep Restoration Project). In Texas, restoration was slow and largely unsuccessful until 1983 when new techniques and renewed interest in the program led to an increasing population and distribution (Kilpatric 1990). Over 600 desert bighorn are now found in Texas, primarily in three populations at Elephant Mountain WMA, Black Gap WMA, in Brewster County, and within the Sierra Diablo metapopulation of the Beach, Baylor, and Sierra Diablo mountains in Culberson and Hudspeth counties north of Van Horn.

In New Mexico, desert bighorn from Red Rock WMA have been reintroduced into six mountain ranges and the facility continues to provide brood stock (Goldstein and Rominger 2003). Some consider the Guadalupe Mountains of New Mexico and Texas a viable future restoration site (Walters 1987), but the New Mexico Department of Game and Fish (NMDGF), and the Texas Parks and Wildlife Department (TPWD) may be reluctant due to social, genetic, political, and agricultural issues. The San Andres National Wildlife Refuge (NWR) herd has been reestablished with bighorns from Red Rock WMA and from Arizona and early reports are favorable for the restoration of this herd. Bighorn populations established in the Ladron, Fra Cristobal, Peloncillo, Alamo Hueco, and Hatchet mountains have met with varied success (Goldstein and Rominger 2003). The introduced bighorn herd on the privately owned Fra Cristobal Mountains in Sierra County, New Mexico increased to approximately 90; however, predation and unknown diseases have reduced this population to less than 60 (E. Rominger, pers. comm., NMDGF). The Ladron and Peloncillo herds have not met expectations to date, and the Hatchet Mountains herd continues to experience setbacks. In the past, desert bighorn from New Mexico have moved into Arizona and Chihuahua (Sandoval 1988; Elenowitz and Humphreys 1989) from ranges in the southwestern portion of the state. Poaching has also been a problem recently (Goldstein and Rominger 2003).

Current desert bighorn status in México includes restoration projects in Coahuila (Sandoval and Espinosa T. 2001) and Chihuahua (Uranga-Thomas 2001). Currently no desert bighorn populations are known to occur in Nuevo Leon and Durango, where the historic status of desert bighorn remains unclear. The restoration effort in northern Chihuahua is a cooperative effort between the federal government of México, the state of Chihuahua, and private cooperators (Uranga-Thomas 2001). No wild, free-ranging populations presently exist in Chihuahua.

Restoration of desert bighorn in the Chihuahuan Desert region is currently underway in Chihuahua, Coahuila, New Mexico, and Texas, with the longer established programs in New Mexico and Texas providing encouraging results, and programs in México providing hope for a bright future for the species in the region. The New Mexico program is experiencing more progress every year and the cooperation of private landowners and conservation organizations has led to success (Goldstein and Rominger 2003). Scabies has not been re-confirmed in the San Andres range (Boyce and Weisenberger 2005), the most extensive habitat in the state (Goldstein and Rominger 2003). Limited sport hunting is taking place, providing important funding for restoration, as populations provide surplus mature rams for harvest (Goldstein and Rominger 2003).

Large, healthy populations of desert bighorn are found in suitable areas of the Sonoran Desert, in Arizona, and Sonora (Tarango and Krausman 1997), often at relatively low elevations. The persistence of desert bighorn in the Sonoran Desert region (native and restored populations) may be due to the fact a great deal of its bighorn habitat is hot, dry, harsh, and not as suitable as Chihuahuan Desert ranges for human settlement and livestock production, most notably domestic sheep and goats. Additionally, significant portions of Arizona's desert bighorn habitat in the Sonoran Desert are protected through large National Wildlife Refuges, military reservations, and other federal land holdings.

The Future—Since Hailey's (1974) report 30 years ago the outlook in Texas has taken a positive turn. Over 600 desert bighorn are estimated to occur in Texas and cooperation between the state, private conservation organizations such as the Texas Bighorn Society, and private landowners has never been better. Nearly 50 permitted sport hunts have taken place to date since 1990 (TPWD unpublished data).

The 2004 distribution may appear bleak compared to the historic (ca. 1880) distribution of desert bighorn in the Chihuahuan Desert region (Monson 1980) but the situation is encouraging when compared to Hailey's (1974) report. In 1974, four populations totaling less than 450 individuals could be accounted for, two native populations in New Mexico, and two small introduced populations in Texas. Remarkable progress has been made in the past 30 years with more than 600 desert bighorns in Texas, more than 300 in New Mexico, and more than 100 in México.

The future looks bright for the desert bighorn's return to the arid mountain ranges across the Chihuahuan Desert, in México and the United States. Recent efforts in México are encouraging. Efforts in New Mexico are proving successful in part, and plans for additional restoration projects are in place. Texas has realized significant success within the past two decades.

Renewed interest in desert bighorn restoration and interest in ecosystem management bode well for the species. As a highly sought after big game animal, desert bighorn provide hundreds of thousands of dollars through hunting for restoration efforts annually. An Arizona permit for a desert bighorn hunt sold at auction for $303,000 in the 1990s (B. Wakeling, pers. comm., Arizona Game and Fish Department). Cooperation between governmental and private interests helps meet the challenges of desert bighorn restoration. New wildlife management techniques and improved monitoring of populations are providing encouraging results. Restoration is an ongoing process however, and threats nonetheless exist. Changing land use, as for

wind power generators, exotic wildlife operations, free-ranging exotic wildlife such as aoudad (*Ammotragus lervia*), habitat loss, disease, illegal harvest, domestic sheep and goat operations, and other impacts, could impede advances. With renewed interest in the conservation of desert bighorn in the Chihuahuan Desert, it is likely that these threats can be overcome and restoration of additional populations can attain success.

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