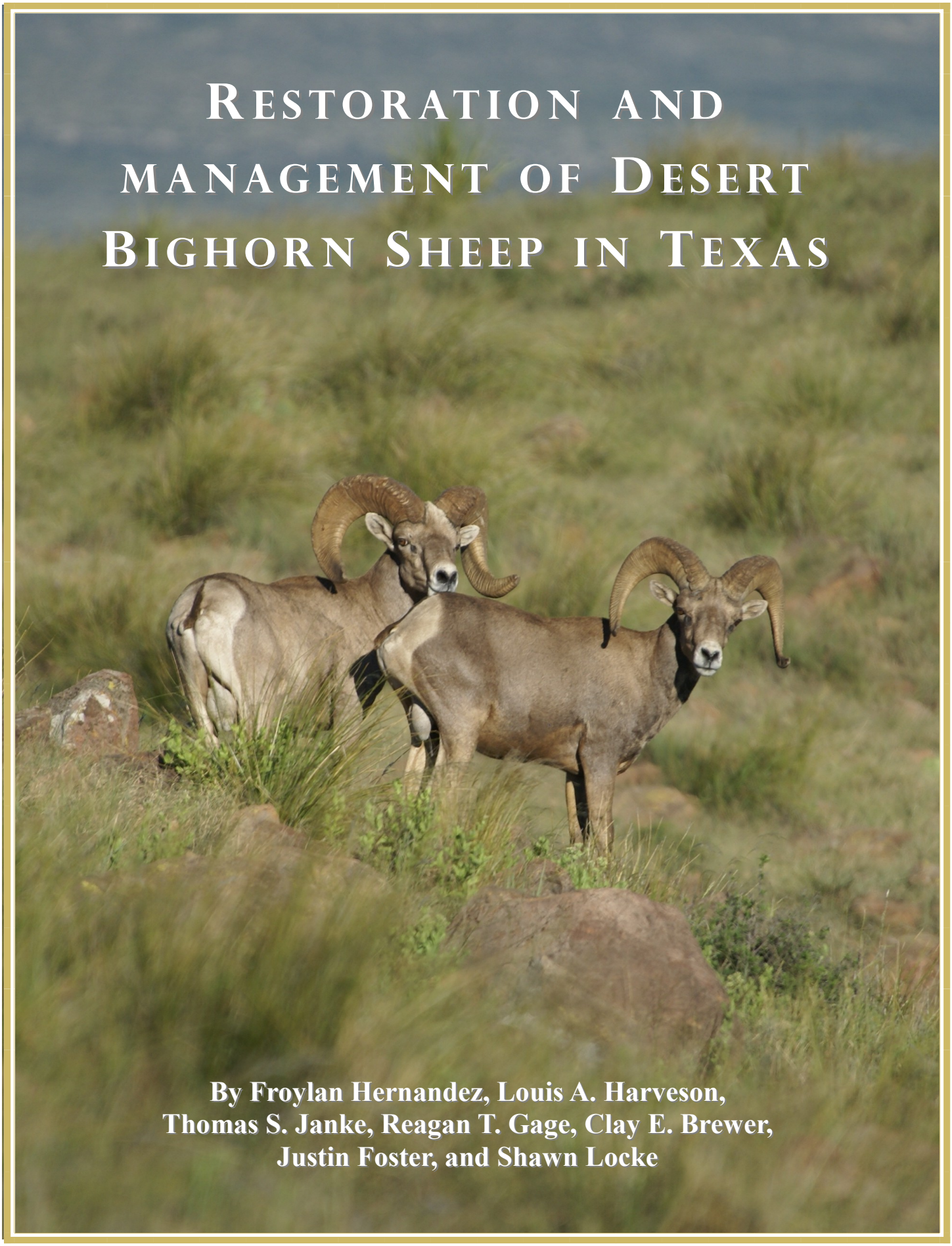
Restoration and management of Desert Bighorn Sheep in Texas



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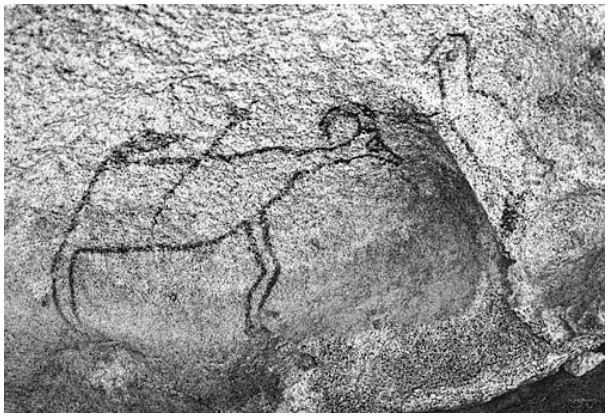
A BRIEF HISTORY OF TEXAS BIGHORNS

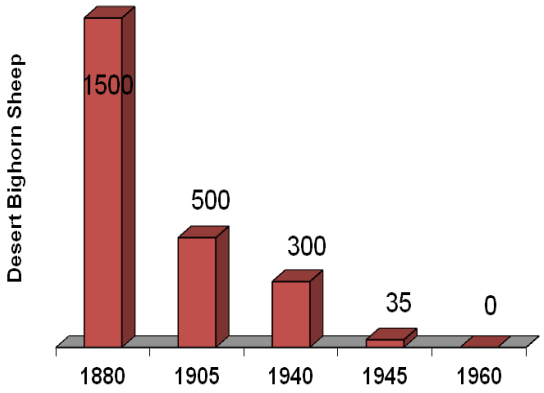
Historically, native desert bighorn sheep occupied 15-16 mountain ranges in the Trans-Pecos region. In the 1880s, an estimated 1,500 bighorns inhabited these mountain ranges and possibly as many as 2,500 prior to 1880.



Desert bighorn sheep once occurred in many of the desert mountain ranges of west Texas as demonstrated by this picto-graph.

However, by the mid-1940s they had disappeared from much of their native mountain ranges. By the early 1960s Texas' native bighorns had been extirpated. Their demise was attributed to unregulated hunting, the introduction of domestic sheep and goats that competed with bighorns for resources, diseases from domestic sheep and goats that bighorns had not been exposed to, and net-wire fencing that impeded natural movements in search of food and water.

Protective measures were taken as early as 1903 with the prohibition of bighorn hunting and later with the establishment of the Sierra Diablo WMA (1945), a sanctuary for the few remaining bighorns. A cooperative agreement in 1954 between the Arizona Game and Fish Commission; Boone and Crockett Club; Texas Game, Fish and Oyster Commission; U.S. Fish



By the 1960s native desert bighorn sheep populations were extirpated from the Trans-Pecos.

and Wildlife Service; and the Wildlife Management Institute marked the beginning of the restoration efforts in Texas. These efforts focused primarily on captive propagation. The first facility was constructed on Black Gap WMA and was stocked with 16 desert bighorn sheep from Arizona in 1959. Additional facilities were constructed at the Sierra Diablo WMA in 1970 and 1983, and Chilicote Ranch in 1977.

Today, desert bighorns are coming back to their historic mountain ranges. Greatly in part to decades of work by Texas Parks and Wildlife Department, various state agencies including Arizona, Utah, and Nevada, as well as wildlife conservation groups such as Texas Bighorn Society, Wild Sheep Foundation, and Dallas Safari Club.

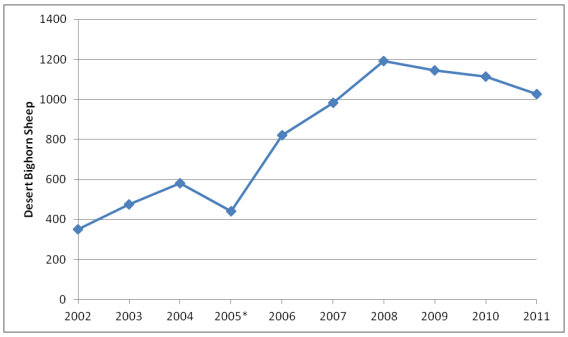
Private landowners have been and continue to be the driving force behind the success of restoration efforts and management of desert bighorn sheep in west Texas.

A NEW ERA IN RESTORATION

Three major in-state translocations have occurred since 1971. The first two (Dec 2000 and Dec 2010) occurred on Elephant Mountain WMA when 45 bighorns were capture and transplanted to Black Gap WMA and later 46 to Bofecillos Mountains of Big Bend Ranch State Park.

Desert bighorn sheep have been restored to 8 of the 15 mountain ranges they formerly occupied.

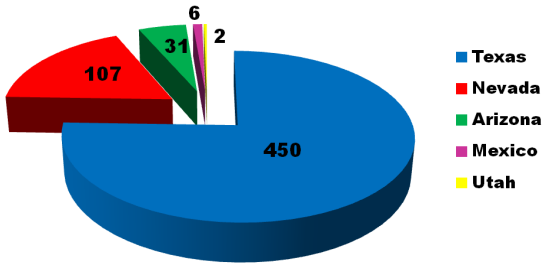
Up until this point, the Bofecillos Mountains and surrounding ranges had been unoccupied by desert bighorn for over 50 yrs. The third, took place in December 2011. This effort marked the largest in-state capture and transplant in Texas bighorn restoration history. A total of 95 bighorns was captured from the Beach, Baylor and Sierra Diablo Mountains located north of Van Horn, Texas. All bighorns were transplanted to the Bofecillos Mountains of Big Bend Ranch State Park to



Desert bighorn sheep populations are increasing in numbers and distribution (Note: 2005 survey efforts were incomplete).

augment the December 2010 release.

Currently, there is an estimated 1,300 bighorns occupying about half of their historic



Initial restoration of desert bighorn sheep relied heavily on out-of-state sources, but growing populations have produced a surplus of 450 sheep for in-state translocations.

mountain ranges in the Trans-Pecos.

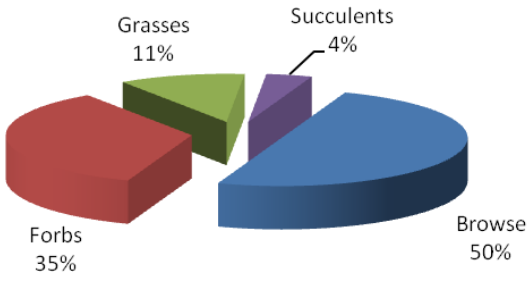
Research will be an important component to all future transplants whenever possible. Research topics investigated will include survival, recruitment, predation, movements, home ranges, and habitat use. Habitat models as well as alternatives to survey methods will be investigated and developed to facilitate the management and restoration of the desert bighorn sheep in Texas.

DIETS OF DESERT BIGHORNS

One of the most essential elements to managing a species is understanding their dietary preferences. This is especially true of desert bighorn sheep as recovery efforts begin to expand to other mountain ranges in west Texas. Knowledge about dietary preferences can help scientists and managers monitor sheep populations and habitat to make scientifically based management decisions. In a study on Elephant Mountain WMA we evaluated the diet of a successfully reintroduced bighorn population.

Fecal samples were collected in order to determine differences between rams and ewes, seasons, and mountain ranges. Diet composition was broken down by genus, species, and forage class. From September 1998 through August 2000 432 fecal pellet groups (209 rams, 209 ewes, and 14 lambs) were collected. Ninety-four plant species were identified in the diets. Forage classes were broken down into browse, forbs, grasses, and succulents. For both rams and ewes diets consisted of 50% browse, 35% forbs, 11% grasses, and 4% succulents.

Predominant plants based on frequency included globemallow, muhlys, wild buckwheat,



Percentage of each forage class in desert bighorn sheep diet at Elephant Mountain WMA, Sep 1998 – Aug 2000.

The diet of ewes differed slightly from rams where ewes consumed greater amounts of grasses.

fourwinged saltbush, trailing ratany, esperanza, goosefoot, ephedra , and honey mesquite.

Ram and ewe diets were very similar. However, some seasonal differences did occur. During winter rams consumed more forbs (35%) than ewes (20%). Grasses made up only 6% of ram diets, while ewes consumed 28% grasses during winter. Browse and forbs dominated lamb diets during spring and summer.

Desert bighorn sheep are opportunistic, and able to adapt their diet depending on available forage. However, a diversity of vegetation is important and helps provide suitable forage throughout the year. Browse appears to be the most important forage class for desert bighorn sheep populations in west Texas. Forbs also play an important role in bighorn sheep diets when available, and especially for lambs during spring and summer.

Desert bighorn sheep habitat is not exclusive to that of other ungulates including elk, aoudad, mule deer, and javelina. Resource managers and landowners should be mindful of the potential for competition for forage that may exist between these species.

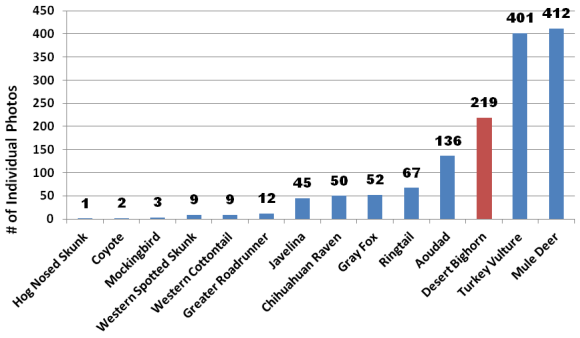
USE OF SUPPLEMENTAL WATER

One of the most limiting and precious resources in arid environments is water. Water is a requisite of all living things. Though water can come in many forms, it is one of the most sought after resources landowners and living organisms seek in the desert mountains of the Trans-Pecos.

With most rainfall occurring in the monsoonal season of July-September, perennial water sources are important to maximize habitat suitability. Water guzzlers have been around since the 1940s. They have a design consisting of an apron for catching rainwater, a pipe to direct the water, a cistern for water storage, and a trough for drinking. If designed properly, guzzlers can provide water year round in the harshest of environments.

A typical guzzler consisting of a catchment, diversion pipe, water storage tanks, and trough.

We conducted a study on the Black Gap WMA to document wildlife use of guzzlers. In that study we documented >12 different species utilizing guzzlers. Bighorn sheep accounted for 15% of occurrences at the guzzlers. As expected, bighorn sheep use of guzzlers peaked during the hottest times of the day and the hottest times of the year. In fact, once temperatures were consistently over 100 F, guzzler use by bighorns was more prominent. By comparing rainfall patterns, we were also able to demonstrate that guzzler use decreased after rainfall events when more surface water



In addition to desert bighorn sheep, a variety of wildlife species were documented using the guzzlers.

was present, preformed water in vegetation was higher, and temperatures were cooler.

In our study, we also documented high use of guzzlers by aoudads, an exotic known to compete with desert bighorn sheep. Unlike bighorns, aoudads used guzzlers in a more generalized fashion. Aoudads consistently used guzzlers year round and throughout the day. Also of concern was the length of time aoudads used guzzlers. Aoudad spent considerable time at guzzlers and were documented loafing around troughs, bedding at, taking mud baths, dust baths, and climbing in guzzler troughs. We also noted that as aoudad use increased on a particular guzzler, bighorn use decreased. We believe these behaviors prevented bighorn sheep from using those specific guzzlers.

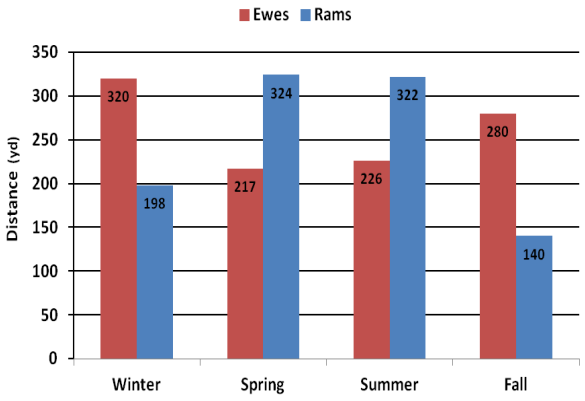
When developing guzzlers, landowners and wildlife managers need to consider habitat requirements and specific watering hole attributes of the species they are managing for. If guzzlers are implemented for bighorn use, we recommend that guzzlers should be placed on the upper 1/3 of the terrain, placed in or near escape terrain (slope >60%), and dense vegetation surrounding the trough (up to 30 yards) should be cleared.

UNDERSTANDING ESCAPE COVER

One of the most critical elements of desert bighorn sheep habitat is cover. Rugged topography or escape terrain provides areas for predator avoidance, lambing, bedding, and is considered to be one of the most important aspects in desert bighorn sheep habitat.

At Elephant Mountain WMA radiocollared bighorn sheep were monitored to determine habitat use. Habitat variables considered included percent slope, elevation, aspect, habitat classification, distance to permanent water, and distance to escape terrain.

Most of the habitat use differentiation between ewes and rams appear to be related with the lambing season. During this period ewes and rams segregate. While ewes appear to use areas that minimize risk of predation to offspring, rams may exploit areas that offer better nutrition needed after the stressful breeding season. This segregation may also help reduce intraspecific competition.



Seasonal distance from escape cover for ewes and rams at Elephant Mountain WMA. Ewes remained closer to escape cover than rams in spring and summer, coinciding with lambing season.

Although rams used a wider range of slopes, desert bighorn sheep typically prefer steeper slopes like these that are approximately 60%.

Overall, ewes remained within 250 yards of escape terrain, while rams generally stay within 300 yards of escape terrain. Both ewes and rams preferred the steepest slopes available (40-79%). However, when ewes and rams segregated, rams used a wider range of slopes (20-79%) to exploit areas with better forage. Both ewes and rams preferred elevations from 4,500 to 5,100 feet. Lower elevations were avoided because they lacked sufficient escape terrain.

Desert bighorn also avoided thick brush cover. Because bighorns rely on visual detection of predators, areas that offer ambush by predators are generally avoided.

RECENT EFFORTS: BIG BEND RANCH STATE PARK

In 2010 and 2011, 141 sheep were captured and transplanted to the Big Bend Ranch State Park (46 from the Elephant Mountain Wildlife Management Area and 95 from the Beach, Baylor and Sierra Diablo mountain ranges). This past effort marks the biggest bighorn translocation effort in Texas history.

The translocation had two purposes. Foremost, the translocation was to restore desert bighorn sheep to historic habitat of the Bofecillos Mountains. Second, the effort help alleviate pressure of burgeoning populations. Population growth rates coupled with browse evaluations suggested bighorn populations were at or near carrying capacity in the Beach, Baylor and Sierra Diablo mountain ranges.

Research plays an important role in recent restoration efforts. Information gathered from satellite and GPS technology help quantify movements, survival, and habits of restored populations. This information is then used to better our management practices for bighorn sheep in Texas.

Of the 141 sheep transplanted to BBRSP, 78 of them were radio-collared for research analysis. These collars collect and save location points every 3-5 hrs for up to 2 years. This information will allow us to see the sheep's movements without having to visually spot or track each individual sheep on a daily basis.

With this information, we will compare movements, home ranges, and core areas between: rams and ewes, diurnal and nocturnal locations, and behaviors of initial and supplemental sheep. We also plan on analyzing topographical tendencies (slope, elevation, aspect, etc.); this may help us delineate preferred travel corridors, thus bettering our knowledge for future restoration efforts.

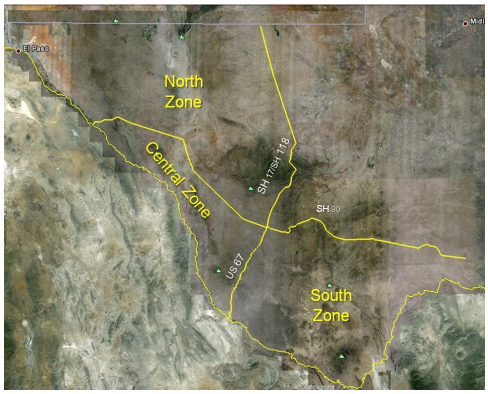
Desert bighorn sheep can now be viewed by park visitors at Big Bend Ranch State Park.

Out of the 78 collared sheep, 15 of the sheep have died. Based on carcass investigations, we determined $\geq$7 of the sheep were killed by mountain lions. Evidence at the mortality sites did not allow us to determine cause of death for 8 bighorns. With the collected GPS data to date, the farthest recorded sheep we know of has traveled >25 miles from the release site. We have also documented sheep crossing back and forth into Mexico. This reiterates the need for international conservation efforts for desert bighorn sheep in Texas and Mexico.

A GLIMPSE INTO THE FUTURE OF DESERT BIGHORN SHEEP

Desert bighorn sheep restoration efforts in Texas began in the mid 1950s. These early efforts, led primarily by Texas Parks and Wildlife Department (TPWD), Texas Bighorn Society (TBS), and various conservation agencies and organizations met little success. These initial labors were primarily in the form of captive propagation. Though this approach produced few bighorns for release, it was costly and accompanied by several obstacles. Some of the problems encountered included disease, predation, and low recruitment. However, restoration efforts within the last 20 years have been more successful.

These recent efforts have focused primarily on the capture and translocation of free-ranging bighorns to either supplement populations with few sheep, or to introduce bighorns back into historic mountain ranges that have been void of sheep since their extirpation in the early 1960s.



Map of Trans-Pecos, Texas delineating the 3 Restoration Zones for desert bighorn sheep.

To facilitate the effort, 3 Restoration Zones have been identified. Restoration priorities and zones are continually reviewed and revised as needed to reflect changes in conditions affecting potential success of restoration and/or expansion.

Limited resources restrict management efforts to focus primarily on areas that demonstrate the greatest potential for success. The individual mountain concept strategy has given way to a broader landscape-level approach. Even though habitat suitability of individual mountain ranges continues to be assessed independently, proximity to other mountain ranges and existing bighorn populations has become a critically important component of the evaluation process.

For more information about the desert bighorn sheep program in Texas, please contact:

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