



# Using Models for Desert Bighorn Conservation

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**N**orth American bighorn sheep (*Ovis canadensis*) once occupied mountain ranges from western Canada to northwestern Mexico and Baja California. The distribution and abundance of mountain sheep in North America have declined from more than 500,000 historically to 185,000 in the 1990s. Specifically, desert bighorn population numbers fell to less than 20,000 individuals in the contiguous United States, and several populations are currently state and federally listed as endangered (peninsular bighorn sheep [*O. c. cremnobates*]).

In the late 1800s in Texas, there were an estimated 1,000 –1,500 desert bighorns (*O. c. mexicana*) living in 16 mountain ranges in the Trans-Pecos region. By the mid-1940s, the Texas desert bighorn population was estimated at 35 individuals, and it is believed that desert bighorns were extirpated in the state by the early 1960s.

Declines are believed to have resulted from a combination of factors, including competition for forage with domestic livestock, introduced diseases from domestic animals, unrestricted hunting and restriction of movements by net-wire fencing. The reduced population of

desert bighorns initiated the need for their restoration in Texas.

One successful approach for restoring declining populations of large mammals like desert bighorns has been their translocation into former habitats. These reintroductions begin establishing populations of threatened species within their historical ranges.

Beginning in 1957, the Texas Parks and Wildlife Department transported desert bighorns from Arizona to a breeding facility to begin the Texas restoration process. Over the next four decades, a total of 146 sheep were transplanted to Texas facilities from Nevada, Arizona, Mexico and Utah. In 2000, less than 50 years after desert bighorn restoration efforts began, 381 free-ranging individuals were reported during annual helicopter surveys in seven of Texas' mountain ranges. For the 2017 population survey more than 1,100 desert bighorns were seen roaming free in the West Texas mountains.

Translocation strategies have proven successful in Texas; however, translocating large ungulates can be expensive, time-consuming and logistically and politically challenging. Additionally, without a delineation of where current suitable ranges occur

and the environmental characteristics of these ranges, translocations have a low chance of success regardless of the number of translocated animals. Therefore, understanding use of habitat and distribution of the species across a landscape level is vital for conservation efforts.

The environmental requirements of desert bighorns are important factors that could influence population fluctuations and determine what habitat characteristics are sought by the species. Although desert bighorn sheep have specific habitat requirements, the relationships within habitat variables (aspect, elevation, slope, etc.) and their effect on habitat selection and distribution across the landscape is complex and poorly understood.

A general lack of knowledge regarding environmental mechanisms and the roles they play for desert bighorn in Texas could negatively impact restoration and management decisions. Therefore, to help understand interactions between environmental characteristics and habitat use models, we initiated a desert bighorn sheep study in the Trans-Pecos region of Texas. Our knowledge of management techniques for animal reintroductions has increased rapidly with the use of models.



Models can help stakeholders such as scientists, biologists and private landowners decide whether or not to reintroduce animals into new habitats, particularly when large landscapes are considered. A model begins with a framework using diagrams, equations and computer programs to evaluate how factors (aspect, elevation, slope, etc.) relate to each other and how they are distributed throughout the landscape.

The model can be translated into graphical descriptions such as maps and charts. Results from these models are a fundamental tool to assess elements such as animal survival, movements and in our particular case, habitat use. Therefore, they are a means to help stakeholders prioritize restoration management decisions.

To create the model used in the Trans-Pecos bighorn study, 247 desert bighorns

were captured and translocated into different mountain ranges in the Trans-Pecos from 2010 to 2015. Upon capture, a veterinarian inspected each animal and took blood samples. The sex, age and physical condition of each individual was recorded, and 60 percent of them were fitted with GPS collars. Once all data was collected and the desert bighorns were equipped with collars, they were transported and released into suitable habitats across West Texas.

Habitat can be the most influential factor for determining success in the translocations of animals undergoing reintroductions. Studies concerning desert bighorn habitat have been done in the past; however, no study has been done at this scale, making it the largest desert bighorn distribution model ever conducted in Texas and the first to use

techniques to determine relations between habitat components and distribution.

With these models, stakeholders involved in reintroductions now have innovative information to make sound management decisions. Results of this study, based on distribution occurrence models, could be used as a key tool to assess suitable areas for desert bighorn restoration.

Models are always improving, and to bolster such models for management decisions, research should continue documenting how environmental factors influence desert bighorn survival and reproduction, as well as identifying international travel corridors and desert bighorn movements between Texas and Mexico. 🌐

### CONSERVATION PARTNER PROFILE: TPWD'S FROYLAN HERNANDEZ



*TPWD Desert Bighorn Sheep Program Leader Froylan Hernandez examined this ram during translocation efforts as part of the restoration program. Knowledge gained from ongoing GPS-collared research has allowed novel insight into habitat use and distribution. (Photo by Charles Post)*

As Desert Bighorn Sheep Program Leader for the Texas Parks and Wildlife Department (TPWD), Froylan Hernandez leads one of the most successful wildlife conservation efforts in Texas. He holds a coveted position that many wildlife biologists might spend decades aspiring to. The way he tells it, how he ended up here wasn't part of some grand plan.

"I'm in this position, not by design, but default," he chuckled. "Over the course of the last three decades, there have been many forks in the road. I am extremely grateful my path has led me here."

He grew up on a ranch near Brackettville, where his father was a ranch foreman. Right out of high school, he joined the Marine Corps. After his discharge, he worked in the ranching business, and then, with the clock ticking on his G.I. Bill benefits, began exploring higher education options.

"I visited with a counselor at Texas A&M, and went down the list of degree options," he recalled. "When we got to 'Wildlife,' I knew that was it."

After he graduated from Texas A&M in 1999, he learned about a job opening at Sul Ross State University and met Dr. Louis Harveson, who would become his boss, his mentor and his friend. He also completed an internship at Elephant Mountain Wildlife Management Area (WMA), which introduced him to TPWD projects and people including Mitch Lockwood.

Harveson and Lockwood convinced him to pursue a master's degree, and once more facing a fork in the road, Hernandez enrolled at Sul Ross State University. He earned a Master of Science degree in Range and Wildlife Management.

In 2005, Hernandez was hired as assistant manager of Elephant Mountain WMA and was immersed in work involving desert bighorn sheep from the very beginning of his TPWD career. In 2010 he was selected as Desert Bighorn Sheep Program Leader by his new boss, Mitch Lockwood, TPWD's Big Game Program Director.

Throughout his TPWD career, Hernandez has maintained close ties with the students and faculty at the Borderlands Research Institute (BRI) at Sul Ross State University.

"BRI research projects have really assisted us in developing effective management plans for desert bighorn sheep and other species," he said. "We don't have the bandwidth to do all the research that is necessary for us to make the best science-based decisions. Wildlife research is what BRI is all about. It's a great partnership."

Hernandez and his team are in the throes of creating a new hunting permit system for bighorn sheep. The old methodology has become obsolete as desert bighorn sheep populations have grown and spread across mountain ranges in West Texas. The new system will be based on the latest scientific research about habitat modeling, a direct result of BRI projects.

"It's been gratifying to watch the growth of Borderlands Research Institute over the last decade," said Hernandez. "In just a few short years, BRI has developed a great reputation. We look forward to a long and productive partnership with BRI students and faculty to benefit wildlife in West Texas and beyond." 🌐

