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Crossing La Entrada

Highways, Fences and Habitat Connectivity in a Restored Pronghorn Population

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Pronghorn restoration efforts in the Trans-Pecos have met with success over the last decade and a half. Following many projects to enhance habitat quality and connectivity, and six translocations from healthy populations in the northwest and northeast Panhandle area, pronghorn numbers in the Trans-Pecos rose from a historic low of 1,200 individuals in 2012 to 6,865 today (2023). Many of these animals were fit with satellite tracking collars that allowed researchers to monitor their survival and movements after release. The data these collars produced showed managers and researchers many things, but perhaps the most striking of these was the importance of habitat connectivity for pronghorn survival.

To understand this, we must know a little about how pronghorn make a living. Unlike deer, pronghorn do not rely on shrubs or browse resources. Instead, they fuel their

high-energy lifestyle on highly nutritious, but equally ephemeral forbs. This class of forage includes many species of the fleshy flowering plants that are first to sprout when temperatures warm or after a rain. However, they are short-lived and their abundance on the landscape changes rapidly with the scattered nature of West Texas rainfall. This means pronghorn must move over large areas to keep up with changing resources.

Almost immediately after the first release of translocated animals in 2011, the impact of restrictive fences was clear. Pronghorn locations clearly reflected pasture boundaries in areas with net-wire or low-stranded barbed-wire fences, and few animals were able to disperse across otherwise ideal habitat (Figure 1). Then came the intensifying effects of drought. While efforts to modify fences had begun in response to what the collar data showed us, movement barriers still exacerbated the effects of the state's worst recorded drought, and pronghorn mortality was high. Though not the conservation success story we had hoped for in our first year of restoration, the lesson was clear. Ranchers, managers, biologists, and researchers began modifying or replacing restrictive fences across the Marfa Plateau and beyond and postponed translocations until range conditions improved.

In 2013, the value of better range conditions and fence modifications and replacement were made apparent, with a successful release into the Marathon Basin. These animals were able to move freely throughout the restoration area, survival was high, and the population grew quickly over the subsequent two years. This was followed by another success in 2014 when, after tremendous fence modification efforts,

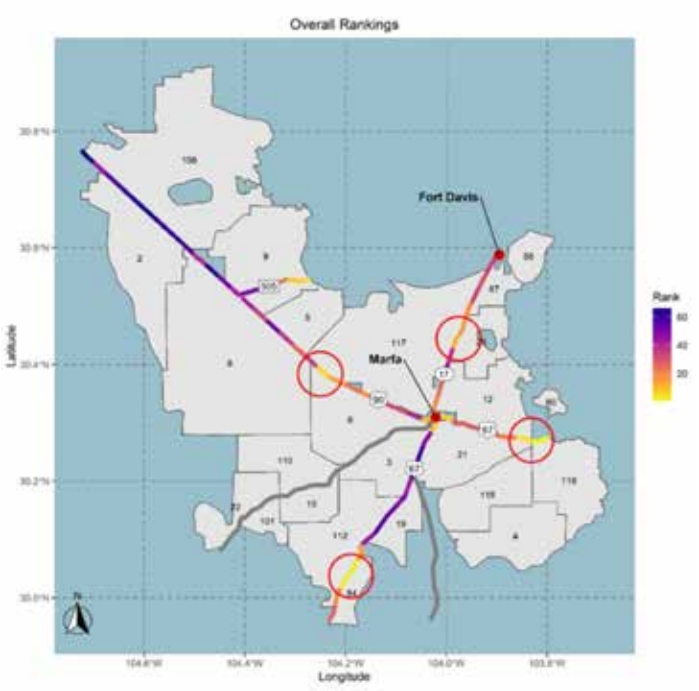

Figure 2: Overall importance of two-mile highway segments across all sets of habitat conditions for pronghorn habitat connectivity on the Marfa Plateau. Higher priority segments have lower ranks (i.e., a rank of 1 implies the most important segment). We identified four key areas, one in each direction from Marfa, that were consistently important for pronghorn (circled in red).

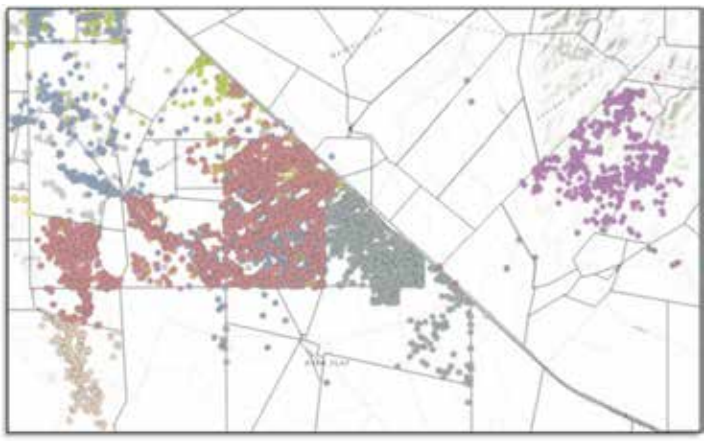

Figure 1: GPS data from pronghorn collared in 2011 which shows the impact of restrictive fencing on pronghorn movement. These early data motivated massive efforts to modify existing fences or replace them with pronghorn-friendly fencing.

pronghorn were able to spread across hundreds of thousands of acres on the Marfa Plateau. Connectivity was a major key.

Over the next 10 years, fence modification and replacement work continued, the restoration expanded, and pronghorn numbers steadily grew. For most of that time, connectivity concerns mostly focused on fences, but we did know that it was rare for pronghorn to cross major highways, and it was time to start addressing this issue. Therefore, in 2022, the Texas Department of Transportation (TxDOT), Texas Parks & Wildlife Department (TPWD), and the Borderlands Research Institute (BRI) partnered to examine highway effects on habitat connectivity. Motivated by the successes of wildlife crossing structures in western states, TxDOT and TPWD were interested in identifying how beneficial these would be to pronghorn and where they might be the most effective, particularly on the Marfa Plateau.

The emphasis on the Marfa Plateau was no accident. The area is split into four quadrants by US-90, US-67, and TX-17 (Figure 2). In addition, US-67 is designated to be expanded as part of La Entrada al Pacifico Trade Corridor to connect the Permian Basin to Mexican ports with access to the Pacific Ocean. It also splits the southeastern quadrant of the Marfa Plateau from the other three. If highway infrastructure carried barrier effects in a high-priority pronghorn restoration area, TxDOT and TPWD wanted to plan how to offset the impact during these efforts.

In situations like this, the value of tracking collar data is difficult to overstate. By monitoring translocated pronghorn with this technology, we accumulated one of the largest data sets of pronghorn movements ever, reflecting 370 individuals over nine years of fluctuating habitat conditions. We paired these data with satellite imagery that captures how resources change on the landscape, as well as fence lines, transportation infrastructure, and topographic information. Then we fit statistical models describing how each pronghorn moved in response to dynamic habitat conditions on the Marfa Plateau. From these models, we were able to create simulated "digital pronghorn" that moved across different landscape conditions recorded across the area by satellites. We then recorded how many times

our "digital pronghorn" crossed each two-mile highway segment under each set of conditions, which allowed us to determine which highway segments were most consistently important for connectivity, which might be important under specific conditions, and which were less likely to be crossed.

We found that highways were a dramatically more impactful barrier than the average fence on the Marfa Plateau. This is partially good news, as it reflects the increased passability of fences after extensive modification and replacement, which now present only a slight barrier to movement on average. A pronghorn was eight times less likely to cross a highway than the average fence, with all other habitat conditions being equal. However, in certain places or under certain circumstances, the quality of habitat was sufficient to tempt our "digital pronghorn" across the road.

Figure 3: An example of a wide fence set-back along the roadway with pronghorn-friendly fencing. This situation would allow animals to more easily clear the roadway when vehicles approach. The bottom wire of the pronghorn-friendly fencing is 18-20 inches from the ground, allowing pronghorn to pass easily underneath.

We identified four key areas where pronghorn were consistently most likely to cross major highways, one in each direction from Marfa (Figure 2). Each revealed additional considerations for connectivity beyond what our models could capture. For example, we found that right-of-way fencing was still commonly old net-wire, as fences along roadways are not included in many of the cost-share programs that facilitate landowners switching to pronghorn-friendly fencing. In addition, habitat conditions can vary dramatically along a two-mile highway segment, and placement of any wildlife crossing structures should consider the suitability of habitat on both sides of the road when deciding where within a highway segment to place it. Finally, in some areas, particularly north of Marfa along TX-17, the habitat is relatively consistent. This means animals are equally likely to cross anywhere along several highway segments, rather than a specific area. While most biologists think of wildlife overpasses to facilitate highway crossings, these are most effective when crossings are concentrated in a particular area. When animals are equally likely to cross anywhere along a long stretch of highway, wider fence set-backs from the roadway and pronghorn-friendly fencing would allow animals more room and a quicker exit from the highway right-of-way (Figure 3). No fence is perfect when it comes to wildlife, and restrictive fencing often keeps wildlife on the road when vehicles approach, rather than allowing them a safe path off of it. More room and easily passable fences would reduce the risk to both pronghorn and motorists and facilitate connectivity among the quadrants of the Marfa Plateau.

By leveraging the information gained from long-term monitoring, agencies like TPWD and TxDOT are able to anticipate both challenges and opportunities created by expanding transportation infrastructure. When transportation projects come along, wildlife and transportation agencies can leverage this information during the planning process to target where wildlife crossings are most needed to enhance wildlife habitat connectivity and minimize the risk of wildlife-vehicle collisions.