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► Beautiful but rare, an ocelot captured by a remote camera roams on South Texas' East Ranch. The cat faces a difficult future in the United States, where only two verified breeding populations exist.



Courtesy of the East Foundation

## Clinging to Survival in the Borderlands

### OCELOTS FACE DWINDLING HABITAT AND GROWING ISOLATION

By Michael Tewes

**O**f the 38 species of wild cats, one of the most beautiful, but rare, is the ocelot. Fewer than 80 of these primarily neotropical cats are believed to reside in the United States. As their habitat shrinks and their populations remain divided, the future of these endangered felines, with their long, ringed tails and splendid collections of black spots over tan pelages, remains in question.

Since 1982, our research team has collaborated with Mexican biologists to study ocelots along a transborder coastal area adjacent to the Gulf of Mexico — an ecological region known as the Tamaulipan Biotic Province. Over the past 35 years, we have revealed many interesting insights about ocelot ecology and their struggle for existence in the U.S.-Mexican borderlands — and matriculated three Mexican and numerous American students with graduate degrees in wildlife science from Texas A&M University-Kingsville in the meantime.

Perhaps our most important discovery points to the difficult future this cat faces in the U.S. Only two verified breeding ocelot populations occur here— both in extreme South Texas, where their habitats are penned in and divided by human development.

#### Two distinct populations

The Cameron population, found in Cameron County, is the smaller of the two groups, occupying a few isolated patches of thorn shrub scattered over a narrow strip of saline coastal prairie flanked by urban and agricultural land uses on both sides of the border. I trapped 10 ocelots here on the Laguna Atascosa National Wildlife Refuge during the first study in 1982. Over the following years, just 10 to 15 individuals were typically identified each year.

The Willacy population occurs farther north, in Willacy County, on private ranches adjacent to — and more importantly, external to — the highly disturbed delta occupied by the Cameron population. The 35 years of ecological data my research team has collected leads me to believe this second group accounts for at least 80 percent of all ocelots in the U.S.

We first trapped and studied ocelots in Willacy County on the Corbett Ranch in 1982 and the Yturria Ranch in 1984, initiating research of an endangered carnivore with support of private landowners — a noteworthy achievement in Texas during the 1980s. Landowner Frank Yturria eventually established several conservation easements protecting thousands of hectares for ocelots. His



actions have been critical in supporting the Willacy population core, and ultimately, in maintaining this species in the U.S. Also important has been the East Foundation, an organization committed to wildlife conservation, private lands stewardship and ranching. A cattle ranch owned by the foundation is home to about 30 ocelots — the largest collection known on any single property, public or private.

In addition to the demographic vulnerability of the small ocelot populations (Haines et al. 2005a, 2006), our research has found genetic drift and inbreeding occurring in both populations, leading to genetic erosion over the survey period from 1985 to 2005. Results documented declines in heterozygosity, allelic diversity, effective population size and loss of private alleles, compared to populations in Mexico (Janecka et al. 2008, 2011). Inbreeding depression is very likely occurring in these small ocelot populations (O'Grady et al. 2006).

### Loss of habitat

Ocelots are a habitat specialist. They prefer to use extremely dense thorn-shrub communities with a closed canopy (Shindle and Tewes 1998, Harveson et al. 2004, Horne et al. 2009), but less than 1 percent of South Texas supports this dense thorn-shrub cover type (Tewes and Everett 1986).

The ultimate problem for ocelots in Texas is lack of sufficient habitat to maintain a population size that can avoid significant genetic erosion, inbreeding depression and demographic vulnerability (Haines et al. 2005a, 2006, O'Grady et al. 2006). They live within the Lower Rio Grande Valley (LRGV), a four-county area at the southern tip of Texas that has experienced heavy development. This is perhaps the most human-dominated border region impacting wildlife and natural resources along the U.S.-Mexican boundary.

A frequently cited U.S. Fish and Wildlife Service report identified vegetation removal for agriculture, urban development and rangeland management as responsible for the ecological deterioration of the LRGV, creating major conservation challenges (Jahrsdoerfer and Leslie 1988).

Amid this heavily impacted landscape, the Cameron and Willacy populations occupy very different areas. The Cameron population is isolated by open landscapes with little thorn-shrub habitat, its patches of habitat hemmed in by agriculture, urbanization and a dense network of roads. In stark contrast, the Willacy population occupies a larger constellation of habitat



Courtesy of Michael Tewes

◀ Author Michael Tewes joins other biologists in collecting information and samples from an ocelot captured on Rancho Caracol in the border state of Tamaulipas, Mexico. The private bird-hunting lodge worked with Texas A&M University-Kingsville to study and protect ocelots on the property.

tracts with much better connectivity and a permeable matrix of native rangelands that provide safer movement within and between subpopulations.

### Growing human impacts

Cameron County's human population increased 21 percent from 2000 to 2010, and the urban landscape increased by 52.8 percent between 1993 and 2003 (Leslie 2016). Both trends are expected to continue, indicating a dire future for the Cameron ocelot population (Leslie 2016).

Research has documented that the most important proximate cause of mortality for ocelots is deadly impacts from vehicles (Haines et al. 2005b). The extensive road network surrounding the Cameron population will increase in lethality as traffic volumes expand.

In part to aid ocelot movements over the region, governments and NGOs have designated landscape corridors for decades throughout the LRGV. These corridors may have achieved other important conservation goals, but they don't seem to have helped the ocelot. Virtually no data show they have enhanced the connectivity of ocelot populations.

Two particular segments — the Rio Grande Corridor and the Coastal Corridor — have been cited frequently as benefiting ocelots, but no empirical evidence shows that. On the contrary, considerable information suggests a lack of significant ocelot use.



Credit: Alfonso Ortega

▲ **Author Michael Tewes releases an ocelot on the East El Sauz Ranch in South Texas. The cat is a member of the Willacy population.**

Land acquisition for the Rio Grande Corridor was initiated in the early 1980s to preserve remnants of the biodiverse, subtropical communities in the LRGV (Leslie 2016). It was also intended to facilitate east-west movement of ocelots across the valley. But one stretch, bounded by international bridges in Brownsville and Hidalgo, contains little ocelot habitat and the corridor remains highly disconnected. An intensely human-dominated landscape along the river makes it extremely difficult for an ocelot to safely traverse the corridor, particularly with four international bridges serving as landscape filters or barriers along the segment.

The Coastal Corridor was created in part to link ocelot populations in Texas and Mexico, providing Texan ocelots a source of genetic diversity from Tamaulipas, Mexico. Protecting a coastal linkage of reserves to Mexico has justified the federal acquisition of coastal wetlands and prairies that support diverse ecosystems. However, only a few fragments of ocelot habitat lie amid this landscape, which is dominated by mudflats, saline coastal prairie and highways that have been responsible for many ocelot deaths.

Empirical evidence shows that in recent decades, no transborder linkage between ocelot populations has existed in a form that would significantly promote movement of genetically diverse ocelots into the U.S. Our conservation genetics research findings (Janecka et al. 2008, 2011, 2014, 2016) reflect an isolated Texas population that has experienced no exchange with a Mexican population for at least 40 years.

A common denominator of these two corridors is the city of Brownsville. It lies between them, just

30 kilometers from the Cameron population. The heavy human footprint here has been documented by Sanderson et al. (2002), who likened Brownsville to some of the largest cities in the world, even more impacted than places such as New York, Mexico City and Beijing. Since this study was published 15 years ago, development has continued in the surrounding region. The Brownsville-San Benito-Harlingen area in Cameron County continues to be one of the fastest-growing metropolitan areas in the U.S. (Chang and Davila 2008, Leslie 2016).

### What will it take?

I have often encountered comments that habitat restoration will be the antidote needed to restore landscape connectivity for ocelots in these designated landscape corridors. In the large majority of cases, however, this has not and will not happen. Managers should recognize that revegetating old crop fields with thorn-shrub seedlings falls far short of establishing ocelot habitat — there is a great difference between these two concepts.

True restoration of ocelot habitat faces numerous challenges. Attempts have failed due to several issues, including frequent droughts; insufficient seedling density; high seedling mortality from herbivory, invasive grasses and planting in unfavorable soil types; and perhaps most importantly, failure to sustain restoration efforts of the same tracts over enough years to achieve success. Another major constraint is insufficient infrastructure to grow the quantity of seedlings that will yield a meaningful amount of quality ocelot habitat. Finally, biologists should avoid restoration of thorn shrub for ocelots in areas where few, if any, ocelots will benefit.

Even if these restoration hurdles are resolved, though, restoring a single hectare into ocelot habitat will be expensive, and it will require many hectares to provide enough habitat for just one additional ocelot.

Unfortunately, little empirical evidence over the past 35 years has shown that landscape corridors are providing a meaningful benefit for the recovery of ocelots in Texas. In addition, biologists and land planners should carefully evaluate whether a proposed recovery action could cause more harm than conservation benefit. Actions such as land acquisition, habitat restoration and road crossings could help an ocelot disperse into an area of high mortality risk. Many extensively developed areas within the Rio Grande delta can be viewed as a landscape sink based on lack of habitat, a variety of anthropo-



morphic threats and the large number of ocelot road mortalities in Cameron County.

The initial report by Jahrsdoerfer and Leslie (1988), which identified factors such as agriculture and urbanization as responsible for removing vegetation, was recently updated by one of the original authors in a comprehensive yet ominous report (Leslie 2016). Leslie (2016:4) stated “Although these [previous] challenges remain, they are largely overshadowed by the exponential growth of the human population in the LRGV over the past 30 years, which shows no signs of slowing. Additional challenges new to the area include international border issues (...such as the border fence and related lighting, construction of international bridges, road construction and expansion...); oil, gas and alternative energy development projects... and even the proposed construction of a rocket launching facility near the mouth of the Rio Grande. ... These activities impinge on successful conservation of the unique and increasingly isolated and rare natural resources of the LRGV.”

A particularly insidious impact, should it come to fruition, will be a proposed causeway from South Padre Island and secondary development, which will intersect the mainland immediately south of the core Cameron population. The adjoining highway and traffic volume will require fencing and crossings to reduce ocelot roadkills. Significant lengths of ocelot-proof fences along highways can be a major landscape filter hindering ocelot movements.

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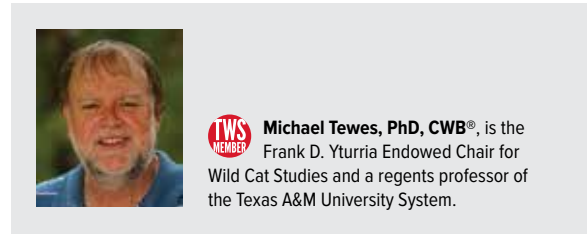
In summary, the Cameron ocelot population is isolated and mostly surrounded by a high-risk landscape with little opportunity to expand significantly. Nonetheless, it is important that this refuge population survives. Each small group of ocelots is critical to the overall survival of the cat in Texas. However, recovery efforts need to achieve direct, tangible results for this target population using the best science and avoid expenditure of funds for ocelot recovery that do not provide a meaningful benefit.

The Willacy population also deserves recovery attention (Haines et al. 2006). Although significantly larger than the Cameron population, it is still small; yet fortunately, it has avoided many of the ecological assaults found in the Rio Grande delta. Programs have not successfully engaged most of the few key landowners with significant ocelot populations, however. Effective programs that target these Texas ranchers — who support the primary breed-

ing ocelot population — should be the number one priority and become the most important strategy for ocelot recovery in the United States.

Finally, a third population, or a metapopulation of small groups or subpopulations of ocelots, is urgently needed in a different South Texas location. This third population would greatly increase the likelihood that this beautiful feline will survive well into the 22<sup>nd</sup> century.

The future of the ocelot in the U.S. has been, and will continue to lie, in the domain of ranchers. Private landowners own 95 percent of Texas, and their support is critical for the cat’s successful recovery. Now let’s determine how we can better engage and involve them. ■



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