

# The Chihuahuan Desert: Diversity at Risk

by Cathryn A. Hoyt



Photo by Michael Bender

The Chihuahuan Desert is a land of superlatives. Covering nearly 250,000 square miles (647,500 square kilometers), it is the largest of the North American deserts. Jutting mountains and low basins form a range of habitats suitable for a broad spectrum of terrestrial and freshwater species. In fact, the Chihuahuan Desert is considered to be one of the most biologically diverse arid regions in the world. It is also one of the most endangered.

## The Landscape

The Chihuahuan Desert stretches from southern New Mexico through the Rio Grande drainage of west Texas/northern Mexico and spreads southward over the Mexican Plateau into the states of Chihuahua, Coahuila, southwestern Nuevo Leon, northeastern Durango, and San Luis Potosí. The desert is bounded to the east and west by the ranges of the Sierra Madre Oriental and the Sierra Madre Occidental, respectively. The northern and southern boundaries, more difficult to define, are usually based on such diagnostic indicators as climate, vegetation, or animal communities.

Basin and range topography predominates the Chihuahuan Desert, with fault-

block mountains separated by down-faulted basins. Typically, the basins are internally drained, resulting in the formation of saline ephemeral lakes known as playas. Dune fields, composed of quartz or gypsum sand, are common throughout the desert, while volcanic features add additional

complexity to the landscape.

The varied geology of the Chihuahuan Desert supports a mosaic of vegetation communities, ranging from desert shrubs such as creosote (*Larrea tridentata*) and tarbush (*Flourensia cernia*) at lower elevations to conifer woodlands at higher elevations. Two features make the Chihuahuan Desert region unique: the vast temperate grasslands that skirt the mountain flanks at mid-elevation and the diversity of yuccas and agaves. One of the agaves, lechuguilla (*Agave lechuguilla*), is considered the primary diagnostic species of the Chihuahuan Desert.

## Modification of the Environment

While some of the inaccessible, montane parts of the Chihuahuan Desert region have floral and faunal communities that are at least relatively intact, much of the desert has been heavily disturbed by human land use. Overgrazing, water diversion, aquifer “mining” (pumping at an unsustainable rate), and overcollecting of native plants and animals are considered the greatest threats to biodiversity in the Chihuahuan Desert ecoregion.

Spanish ranchers and, later, American settlers were drawn to the Chihuahuan Desert region by the lush grasslands and potential for grazing. Once, grasses in the Big Bend region of Texas were said to have been tall enough to brush the bellies of horses. Ranchers believed that the supply of grass to feed livestock was unlimited. By the mid-19<sup>th</sup> century, the stocking of desert grassland ranges with cattle, sheep, and goats was progressing at a phenomenal rate. In 1900, the desert grasslands of west Texas supported over 9 million herd animals, up from 500,000 head in 1830. The ranges of the southwest were soon stocked to capacity with no overflow ranges in case of drought.

What ranchers could not know is that the luxuriant grasslands of the 19<sup>th</sup> century were the expression of a cooler, wetter period that was to end abruptly at the turn of the century. After 1900, droughts became more frequent, and grass cover on heavily grazed ranges declined by up to 70 percent. As warmer, drier conditions prevailed and heavy grazing continued, thousands of acres of Chihuahuan Desert grasslands were converted to desert shrubland, a process that continues to this day.

In addition to climate change and overgrazing, certain water-use practices are having significant impacts on the desert. The Chihuahuan Desert is punctuated by large lake basins and crisscrossed by drainages—indicators of a time thousands of years ago when water was more plentiful and lakes and flowing rivers were abundant. With climatic warming and drying over the past 10,000 years, water sources dried up, tributaries became isolated from the main rivers, and headsprings that once supported interconnected pools and



**Some desert grasslands have survived overgrazing.**  
CDRI photo

perennial streams shrank to form small, isolated pools and marshy wetlands known as cienegas. Water, once relatively abundant in the Chihuahuan Desert, is now a precious—and very limited—resource.

Problems arise as urban areas in the desert continue to expand and fertile desert soils are put into agricultural production. Up to 99 percent of the water in the perennial rivers of the Chihuahuan Desert is diverted to municipal water supplies or to irrigate fields. The consequences of current water-use practices include the loss of native fish populations and the replacement of diverse riparian forests with monocultures of tamarix (*Tamarix* spp.), an invasive tree introduced in the 1800s.

In addition to water diversion, mining of aquifers is a serious threat to freshwater species. Groundwater pumping can significantly lower the water table, reducing—or often completely eliminating—spring flow. Many cienegas of the Chihuahuan Desert once supported an amazing array of endemic fish, snail, and other invertebrate species. However, these hotspots of biodiversity are rapidly being lost as groundwater pumping lowers the watertable, reduces springflow, and significantly decreases the number of intact cienegas.

Some inhabitants of the Chihuahuan Desert are imperiled simply because people want to possess their own little piece of the desert in the form of a wild plant or animal. The Chihuahuan Desert is recognized for the extraordinary diversity of cacti and succulents found there. According to the World Wildlife Fund, more than one-third of all cacti

species are found in Mexico, with many of the 345 Chihuahuan Desert species found only in small areas. Because the entire range of a particular cactus species may be confined to a single rock outcrop, species can be rendered extinct all too easily because of overcollecting, especially for the commercial trade.

### Conservation and Education

Conservation efforts in the Chihuahuan Desert are complicated by the fact that the ecoregion extends across an international border and numerous state boundaries, both in Mexico and the United States. Nonetheless, attention is being focused on the Chihuahuan Desert through the international, multidisciplinary efforts of organizations such as the World Wildlife Fund, the Nature Conservancy, the Instituto de Ecología in Mexico, and federal agencies such as the National Park Service and the U.S. Fish and Wildlife Service.

In addition, private organizations like the Chihuahuan Desert Research Institute (CDRI) are devoted to promoting an awareness of the desert through research and education. Founded in 1973, the CDRI encourages student research through scholarships and the W. Frank Blair Student Paper competition, maintains a regional research library, and serves as a clearinghouse for information



**The endangered Chisos Mountain hedgehog cactus**  
Photo by Tom Alex

about Chihuahuan Desert research. Research data are presented to the general public through interpretive programs centered at the CDRI's 507-acre (205-hectare) site. Here, visitors can participate in seminars or stroll through the 20-acre (8-ha) arboretum, where over 100 species of Chihuahuan Desert trees and shrubs—representing communities from the desert lowlands through the conifer highlands—are grown. One of the highlights of a visit to the CDRI is a tour of the Cacti and Succulent Greenhouse, which houses over 300 species of Chihuahuan Desert cacti and succulents. The more energetic visitor can hike into a protected canyon where permanent springs and pools support a diverse freshwater ecosystem, or climb to the top of an igneous outcrop to enjoy spectacular views of the surrounding desert grasslands.



**For more than 20 years, the Chihuahuan Desert Research Institute has propagated endangered species of cacti for revegetation.**  
CDRI photo

Coordinated efforts of public and private organizations in both Mexico and the United States is leading to a broader understanding of the Chihuahuan Desert and the threats to its ecosystems. With this understanding will come a greater appreciation of the desert and new ways of addressing human needs while maintaining the biodiversity characteristic of the Chihuahuan Desert.

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