The Janos Biosphere Reserve, Northern Mexico

BY RURIK LIST, JESÚS PACHECO, EDUARDO PONCE, RODRIGO SIERRA-CORONA, and GERARDO CEBALLOS

Introduction

November 28, 2009, marks a historic date for the conservation of large endangered mammals in Mexico. That day the gate of the quarantine corral, where 23 bison (*Bison bison*) from Wind Cave National Park had spent the two weeks since their arrival from the United States, was opened and the bison released, running into the short grass prairie of Janos, Chihuahua, Mexico. For the first time in at least a century, genetically pure bison roamed again in Mexico (see figure 1).

The release of the bison was the preamble of an even more important, large-scale conservation issue. On December 8, the Janos Biosphere Reserve (JBR) was established by presidential decree (Diario Oficial de la Federación 2009; figure 2). With more than half a million hectares (more than a million acres), JBR became the first federally protected area with the main objective to protect native grassland ecosystems in Mexico (see figure 3). The decree was the culmination of more than two decades of scientific research and conservation work in the region, whereas the bison release marked the beginning of a new era in JBR, which will be focused on restoration, improved land management practices, and the development of alternative use of the region's resources.

Gerardo Ceballos, Jesús Pacheco, Rurik List, Rodrigo Sierra-Corona, and Eduardo Ponce (left to right). Photo by Mike Lockhart.

The conservation story of JBR goes back to the time when Aldo Leopold visited Río Gavilán in the neighboring mountains of Casas Grandes, where he found exemplarily well-preserved ecosystems (Leopold 1937). Around that

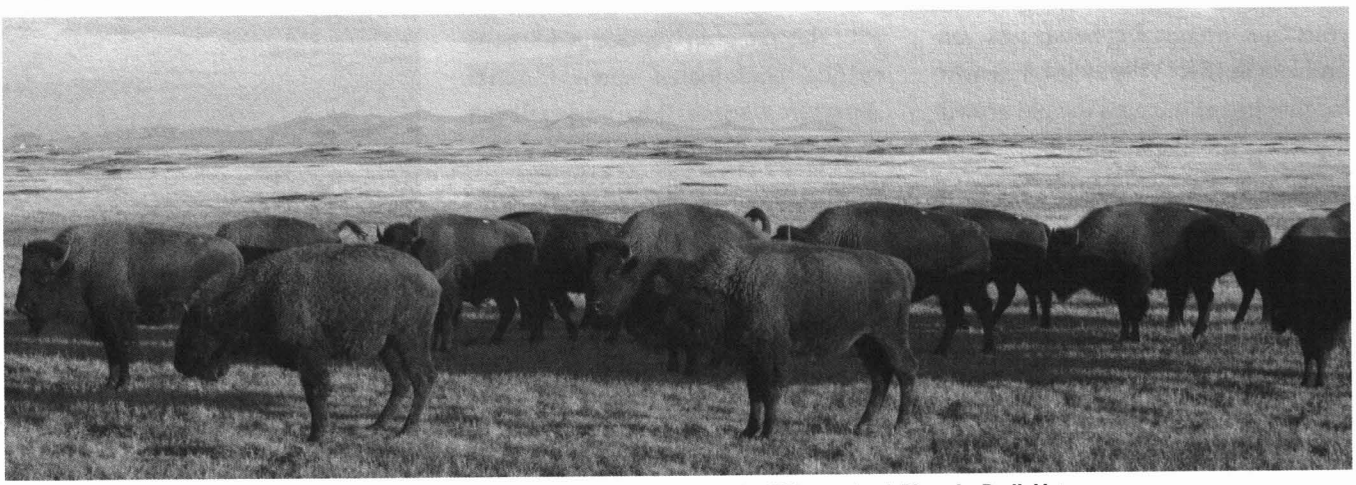

Figure 1—Herd of genetically pure bison from Wind Cave National Park roaming in the JBR grassland. Photo by Rurik List.

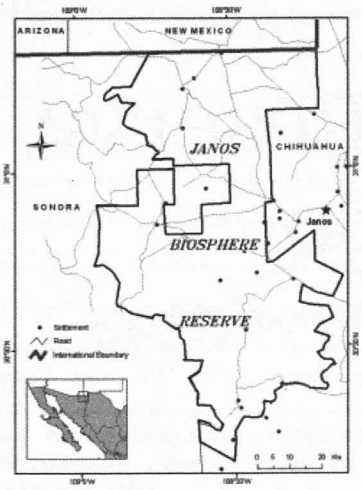

Figure 2—Map of the Janos Biosphere Reserve.

Figure 3—The JBR is the first federal reserve created with the main objective to protect grassland ecosystems. Photo by Eduardo Ponce.

time, Río Gavilán and the mountains of Janos were part of a large block of federal lands inhabited by many species, including three that regrettably are now extinct in the area: grizzly bears (*Ursus arctos horribilis*), gray wolves (*Canis lupus*), and imperial woodpeckers (*Campephilus imperialis*; figure 4). The valleys, on the other hand, were part of extensive cattle ranches covered by perennial grasslands. In the 1930s and 1940s, the Agrarian Reform gave away the federal lands and subdivided cattle ranches to satisfy landless peasants' demands. The impact of their activities and of forestry companies strongly changed environmental conditions, and a few years later, overgrazing became a severe problem in JBR (Villa 1955). Intensive logging had eliminated the old growth forest, except in the most inaccessible areas, and one by one, the imperial woodpecker, grizzly bear, and gray wolf, in that order, disappeared from the region and eventually from Mexico (Ceballos and Navarro 1991; Ceballos and Eccardi 2003).

Biological Diversity

Despite the loss of these iconic species, the distance of JBR from the nation's capital in a centralized country helped to maintain most other biological components of the sierras and valleys of JBR, while the rest of the country was losing both species and habitat. In 1988, when Gerardo Ceballos went searching for the black-tailed prairie dog (*Cynomys ludovicianus*) colonies reported by Anderson (1972), he found a 55,000-hectare (135,850 acre) prairie dog complex, which made it the largest in North America as 98% of the area occupied by prairie dogs had been decimated by poisoning and plague (Ceballos et al. 1993; Miller et al. 1994; figure 5).

This discovery represented a hope to find black-footed ferrets (*Mustela nigripes*), a species that depends on prairie dogs for food and shelter, and which became the first species to disappear from the wild as a consequence of the decline of prairie dogs across North America (Clark 1989). Although no ferrets were found, it became clear that the extensive prairie dog towns were of continental importance. In 1991, the Institute of Ecology from the National University of Mexico (Universidad Nacional Autónoma de México–UNAM) initiated the first biological studies in the area and started a black-footed ferret reintroduction program in 2001 (see figure 6).

Soon it became clear that the JBR area was biologically diverse, and it was recognized as priority area for biodiversity conservation in North America (List et al. 1998; Ceballos

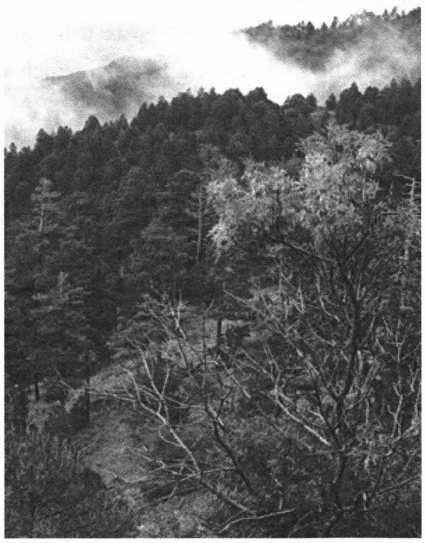

Figure 4—The sierras of JBR are covered by temperate forests, which once hosted grizzlies and wolves. Photo by Rurik List.

Figure 5—The JBR grasslands maintain one of the largest prairie dog complexes in North America. Photo by Gerardo Ceballos.

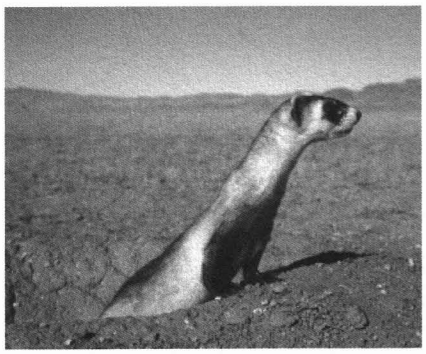

Figure 6—Black-footed ferrets have been reintroduced in JBR. Photo by Rurik List.

1999; Manzano-Fischer et al. 2000; Dinerstein et al. 1998; CONABIO 2000; table 1). The outstanding biological diversity was partly the result of the presence of prairie dogs, which through their activities modify the grasslands, providing home to species such as burrowing owls (*Athene cunicularia*) and food to terrestrial and avian predators (Ceballos et al. 1999; List et al. 2003; figure 7). Also, because of their foraging behavior, they keep the plants low and modify the composition and structure of the vegetation, allowing species that need short vegetation to abound. In addition, their burrowing activities loosen the soil and improve habitat for soil invertebrates (Miller et al. 1994, 2000; Ceballos et al. 2005; Davidson et al. 2010).

There are several contributing factors to the notable biodiversity of JBR: the altitude ranges from 1,400 m (4,590 ft.) in the extensive valley, which starts at the foothills of the Sierra Madre Occidental, then goes north to New Mexico, and south and east to smaller isolated sierras in Chihuahua (see figure 8) to 2,600 m (8,530 ft.) in the peak of Las Guacamayas. The area is found at the western end of the Chihuahuan Desert, which gives the characteristic composition to the grasslands and shrubs; the temperate pine and oak forests of the Sierra Madre Occidental reach the northern end in JBR, with characteristic species such as the thick-billed parrot (*Rhynchopsitta pachyrhyncha*) and eared trogon (*Euptilotis neoxenus*). Most of the JBR is covered by open grasslands and grassland-shrubs, but there are also temperate forests, mesquite shrublands, halophytic vegetation, and agriculture (Ceballos et al. 2005).

Table 1—Diversity and conservation status of the terrestrial vertebrates of Janos Biosphere Reserve, Chihuahua, Mexico.

Taxon	Orders	Families	Genera	Species	Status		
					EN	TH	SP
Amphibians	2	4	5	13	0	0	4
Reptiles	2	6	19	34	0	7	8
Birds	17	53	157	257	3	8	17
Mammals	4	18	47	79	6	3	2
Total	25	81	228	383	9	18	31

EN = Endangered, TH = Threatened, SP = Special Protection.

The Creation of the Reserve

Over the years, the studies continued producing information that justified the legal protection of the Janos ecosystems, so in January 2002 we initiated the long process to include JBR in the National System of Protected Areas of the National Commission of Protected Areas (Comisión Nacional de Áreas Naturales Protegidas–CONANP) as a biosphere reserve. Over time, many governmental and nongovernmental institutions participated in this process.

The justification to create the reserve was ample and solid. JBR maintains a considerable amount of native grasslands (220,000 ha/543,400 acres), which is a critically threatened ecosystem in Mexico. The JBR was ranked the second most important area for the protection of mammals in Mexico after the Montes Azules Biosphere Reserve in the Lacandon Tropical Rain Forest of southern Mexico (Ceballos 1999).

These grasslands maintain the second largest prairie dog complex of

Figure 7—The ferruginous hawk is one of many birds of prey that prey upon prairie dogs and abound in JBR. Photo by Eduardo Ponce.

prairie dog towns in North America, the only free-ranging bison herd in Mexico and the southwestern United States, and small populations of Mexico's critically endangered pronghorn (*Antilocapra americana*) (Ceballos et al. 2005; List et al. 2007; List and Valdéz 2009). JBR has the only recorded breeding population of North American porcupine (*Erethizon dorsatum*) in Mexico, the largest breeding population of burrowing owl within its native habitat in North America, the largest golden eagle (*Aquila chrysaetos*) population in Mexico (List et al. 1999; Manzano-Fischer et al. 2006; McNicoll 2005), and one of the most important populations of the green toad (*Anaxyrus debilis*) (Santos et al. 2008). Finally, the reserve is an important wintering site for grassland birds, including species of conservation concern, maintaining about 2% of the entire population of mountain plover (*Charadrius montanus*) during the winter (Manzano-Fischer et al. 1999, 2006).

The mountains of JBR provide refuge to and the third most important nesting site for the endangered thick-billed parrot, one of the largest populations of black bears (*Ursus americanus*) in the Sierra Madre Occidental, and have been identified as the most suitable area for the reintroduction of the Mexican wolf (Araiza et al. 2007; Lammertink et al. 1997; List et al. 1998). There are populations of aspen forests (*Populus tremuloides*), which cover a naturally small area in Mexico, but their presence in JBR is significant (Ceballos et al. 2006).

As often happens, places rich in biodiversity are also rich in culture, and JBR is no exception. Hunter-gatherers lived here well before the written language, leaving petroglyphs and arrowheads as a sign of their presence. Later on, the Paquime culture from what is now Casas Grandes exerted its influence on the JBR, with thick adobe walls near the perennial streams, terraces in the mountains, and cliff dwellings providing testimony that the area had an important human population for centuries (Di Peso et al. 1973; Minnis and Whalen 2003; figure 9). The town of Janos was founded around 1580 by Franciscan missionaries, and in 1686 a military garrison was established to protect it from the Apache raids, but despite that, Apaches ventured frequently into the JBR until very recently (University of Texas 2010).

Figure 8—In the foothills, the grassland mixes with oaks. Photo by Rodrigo Sierra-Corona.

Current Situation

The JBR region is part of a continuous system of semi-arid grassland that includes parts of New Mexico, Arizona, Texas, and Chihuahua, and is one of many protected areas along the border, some of them transboundary (Ceballos et al. 2009). As with many other binational conservation areas from the Californias to Tamaulipas/Texas, the connectivity of the biosphere reserve to the United States has been partially cut by the new border fence (List 2009). Normandy-style metal barriers with wire mesh and barbed wire set up in the winter of 2008 block part of northern portion of the reserve from the well-preserved grasslands, managed by the Maplai Borderlands Group and the Animas Foundation in Hidalgo County, New Mexico. Pronghorn and bison, among many other species, crossed back and forth over the international line, but the new fence is impassable for most medium and large mammals, and there is the risk that the fence or pedestrian wall will expand to the reminder of the Janos-Hidalgo, which would eliminate the pronghorn and bison

north of Janos (List 2007; List et al. 2007; List and Valdéz 2009).

Presently, about 2,600 people live in seven towns and scattered isolated houses or ranches within the JBR. Although most are Mexicans from different parts of the country, mainly the north, the Mennonite community is large and has an important influence in the economy of the area as the intensive agriculture brings both money and labor into the area.

Cattle ranching is the main productive activity within the JBR, but the importance of agriculture has been growing rapidly, emphasizing the need to give legal protection status to the area. After 15 years of nearly continuous drought with a fixed cattle stocking rate, severe overgrazing, soil erosion, reduction of keystone species (prairie dog), and changes in species composition and abundance, the ultimate result has been ecosystem degradation and severe desertification (Ceballos et al. 2010).

These changes were accompanied by a reduction of environmental services for the local people, such as the reduction in forage for cattle, making it unviable for many people to make a living from the land, and forcing many, especially the young, to emigrate, and the older to sell their rangelands for industrial farming. Many prairie dog towns were illegally converted into agricultural lands, and illegal drilling of wells for the center pivot irrigation systems reduced the underground water available for both ranching and some villages, generating frictions between the formerly amicable guilds of farmers, ranchers, and townspeople.

Because the concept of biosphere reserve accommodates both biodiversity and people, the establishment of a biosphere reserve became an opportunity to conserve important ecosystems and a significant part of the native flora and fauna in northern Mexico, reduce the degradation processes, and improve the current use and management of the resources of the area, which represented hope for keeping and improving the decaying quality of life of the local people. This prompted the support of the Janos inhabitants toward the establishment of the reserve without any opposition, the exception being a few ranchers and farmers.

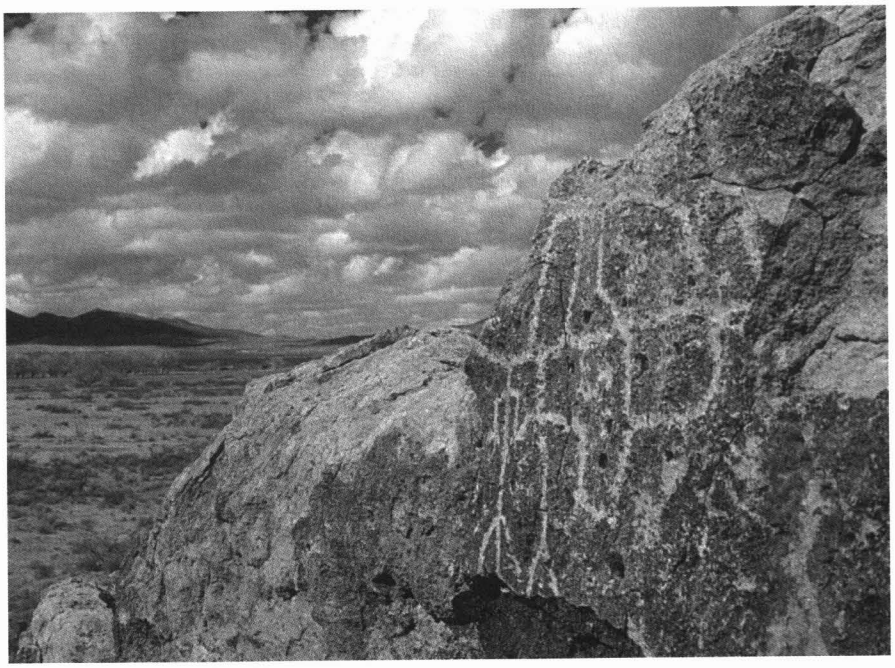

Figure 9. The ancient inhabitants of hunter-gatherers of JBR left petrolyphs as a sign of their presence. Photo by Rurik List.

The Future

The restoration of JBR's ecosystems and ecosystem services is directly linked to a better use and management of the land and research focused toward understanding the interaction between biodiversity and productive activities. We are not only looking for ways to make biodiversity and productive activities compatible, but also ways to make the main economic activities foster conservation efforts (Ceballos et al. 2009; Davidson et al. 2010; L. Martínez pers. com. 2010). This way, we will be using cattle grazing to maintain and expand prairie dog towns and control shrub expansion, and intensive agriculture to restore native grasslands in areas where the perennial grasses have disappeared and the natural recovery of the system is unlikely or in very large time scales.

Local people are already participating by removing cattle from pastures or decreasing the numbers of cattle, setting up experimental exclosures, and planting native grasses in degraded areas. Simultaneously, we continue to restore species and enhance wildlife populations, mainly in the valley, but the sierras of JBR are scantly populated, much better preserved, have less pressure than the lowlands, and are important parts of the reserve. Partly because of the inaccessibility of the rugged terrain that has preserved the ecosystems of the sierras, this portion of the reserve is the least studied, but is nonetheless a place for wandering, where one can still walk for days without meeting other people, and where puma (*Puma concolor*) and wild turkey (*Meleagris gallopavo*) still abound. Hence the work in the mountains has

to increase, and it is certain that many surprises await. We hope that soon we will be able to hear the howling of the wolf in JBR, one of the last wilderness areas of Mexico.

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