

Borderlands Conservation Hotspot

3. Sky Islands



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The Sky Islands, also known as the Madrean Archipelago, is a unique landscape of mountains and grasslands globally recognized for its biodiversity.

Forested mountain ranges rise from desert grasslands like towering islands in a sea. This is the aptly named Sky Islands, a globally unique region where temperate and subtropical zones, the Chihuahuan and Sonoran deserts and conservation-minded Mexicans and Americans come together. Successful conservation here often requires cross-border collaboration, but with all the talk of the wall, a shift is occurring. “The current political reality has complicated cooperation,” says Mirna Manteca, a biologist with the nonprofit Sky Islands Alliance.

The bioregional convergences and changes in temperature and precipitation from desert floor to mountaintop endow the Sky Islands with a biological diversity that is among the richest in the world. In this region of 47,000 square miles extending north from the Mexican states of Sonora and Chihuahua into southern Arizona and New Mexico, the tropical and temperate zones meet. The ranges of jaguars and military macaws overlap those of black bears and bald eagles.

The region’s patchwork of protected public and private lands is an investment in its natural endowment. Creosote scrublands, stands of saguaro and organ pipe cactuses, mesquite forests and some of the last best natural grasslands in the Southwest characterize the Sky Islands flatlands.

Broadleaf forests prevail higher up the mountains, with mixed conifers reminiscent of Canada at the top.

Streams running from the mountains join to become rivers like the San Pedro, which flows north from Mexico into Arizona near Sierra Vista. A ribbon of green winding through the arid land, the San Pedro is one of the last undammed rivers in the Southwest (Webb, Leake and Turner 2007) and one of the most important migratory bird flyways in the region (San Pedro River Ecology 2017). The river corridor shelters 300 species of birds (U.S. Fish and Wildlife Service [FWS] 2012a), 200 species of butterflies and 20 species of bats as they fly from Central America and South America and back (Arizona Important Bird Area Program 2017). The river sustains the

WILDLIFE AND HABITAT ON THE LINE

Land managers and conservationists have their work cut out for them in the Sky Islands. The southern Arizona portion, which encompasses the city of Tucson, is part of the Arizona Sun Corridor. This corridor is one of the fastest growing parts of the United States, bringing sprawl and roads that destroy and fragment habitat. U.S. Interstates I-10 and I-40 are formidable barriers for jaguars and other mammals traveling north. In Mexico near the border, east-west Highway 2, running parallel to the border, is undergoing a major upgrade that will make it less passable for wildlife in places without wildlife overpasses or underpasses.

Throughout the Sky Islands, logging, grazing, transmission lines, mining and water extraction degrade habitat. Off-road vehicles damage soil that can take decades to recover (Abella 2010). Fire suppression allows scrub to invade grasslands, displacing pronghorn, burrowing owls and prairie dogs. Habitat destruction in the biologically rich Sky Islands has landed about 40 species found in Arizona and Sonora on either the U.S. or Mexican endangered species list or both (Fernandez et al 2009). Appropriation of water and introduction of green sunfish and other exotics has left 20 of 35 surviving native fishes in Arizona federally threatened or endangered (Arizona Game and Fish Department [AGFD] 2017). Loss of riparian forest helped put the western yellow-billed cuckoo and southwest willow flycatcher on the

largest intact mesquite bosque (forest) in Arizona (Audubon Society 2017), an area that harbors 40 percent of the Arizona nests of endangered Southwestern willow flycatcher (Audubon Society 2017). In places the San Pedro and its tributaries have dwindled or run dry, their waters diverted for agriculture, industry and households, but the stretches that still flow are havens for endangered fish, frogs, water snakes and as many as 84 mammal species (Sonoran Institute 2018).

Although some border fencing is already in place in the Sky Islands, key cross-border wildlife passages remain open—for now—and jaguars, an extirpated U.S. endangered species, are entering the United States from Mexico.



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endangered species list (Daw 2013; Daw 2014).

Studies show that top predators like mountain lions, wolves and jaguars are essential to maintaining healthy ecosystems. In the Sky Islands, mountain lions are under intense hunting pressure. Trail-camera monitoring indicates a marked decrease in their borderlands numbers over the last decade. (Malusa 2018).

A hunter shot the last female jaguar in the United States in 1963 (Brown, Lopez Gonzalez 2001), but male jaguars from a population in Sonoran, 120 miles into Mexico, are now venturing over the border. FWS released a draft recovery plan, but it has no provision for protecting potentially vital movement corridors (Peters 2017).

FWS reintroduced Mexican gray wolves, which had been extirpated from the United States by the middle of the 20th century. But the latest recovery plan for the species restricts them from moving into millions of acres of suitable habitat and does not allow for the connectivity necessary for healthy, sustainable populations.

Conservation lands

Recognizing the biological importance of the Sky Islands, agencies, nonprofit groups and individuals in the United States and Mexico have made monumental, complementary investments in conservation lands (Figure 6).

In southeastern Arizona and the southwestern corner of New Mexico know as the “bootheel,” a complex of U.S. and Mexican protected areas sandwich more than 60 miles of border, allowing bison, bighorn sheep and other wildlife to move back and forth. The conservation lands on the U.S. side include the private Diamond A Ranch, San Bernardino National Wildlife Refuge and 1,052 square miles of wilderness

and wilderness study areas.

Mexico has 203 square miles acquired and protected by Cuenca Los Ojos, a private foundation, and the huge (2,032 square miles) federal Janos Biosphere Reserve. The Janos reserve boasts one of largest remaining prairie dog colony complexes in the world (Sierra-Corona et al 2015) and reintroduced endangered black-footed ferrets that rely on the prairie dogs and their burrows for food and shelter (Ceballos et al 2010).

Some 80 miles to the west is another complex of protected lands with several U.S. natural areas and wildernesses. The complex includes Buenos Aires National Wildlife Refuge and the San Pedro Riparian National Conservation Area, which protects 40 miles of the San Pedro River running north from the border.

On the Mexican side the private Rancho Los Fresnos reserve is managed by the nonprofit Naturalia to protect the largest remaining group of *ciénegas* (springs and wetlands) in the San Pedro River watershed (Smith 2017). Beaver reintroduced in the U.S. portion of the Lower San Pedro River found their way across the border to Rancho Los Fresnos (Smith 2017), where the dams of these once extirpated rodents retain water that soaks into the ground, raising water tables and nurturing trees and smaller plants (New Mexico Department of Fish and Game 2017).

Also in this complex is Las Cienegas National Conservation Area, 70 square miles of rolling grasslands, oak-studded hills and *ciénegas*—the marshes that give it its name. This area managed by the Bureau of Land Management (BLM) bridges the Santa Rita and Whetstone mountains and shelters American pronghorn, endangered western willow flycatchers,

northern Mexican garter snakes, Sonoran leopard frogs and Gila top minnows and other endangered fishes (Bodner and Sims 2008; FWS 2014b).

AGFD is re-establishing black-tailed prairie dog colonies in the valley’s grasslands (AGFD 2018), and the Frog Conservation Project is enhancing habitat to re-establish endangered Chiricahua leopard frogs throughout the valley (Frog Conservation Project 2018). The nonprofit Cienega Watershed Partnership works with the BLM, Bureau of Reclamation, Pima County and valley land owners to restore habitat and engages youth in hands-on restoration

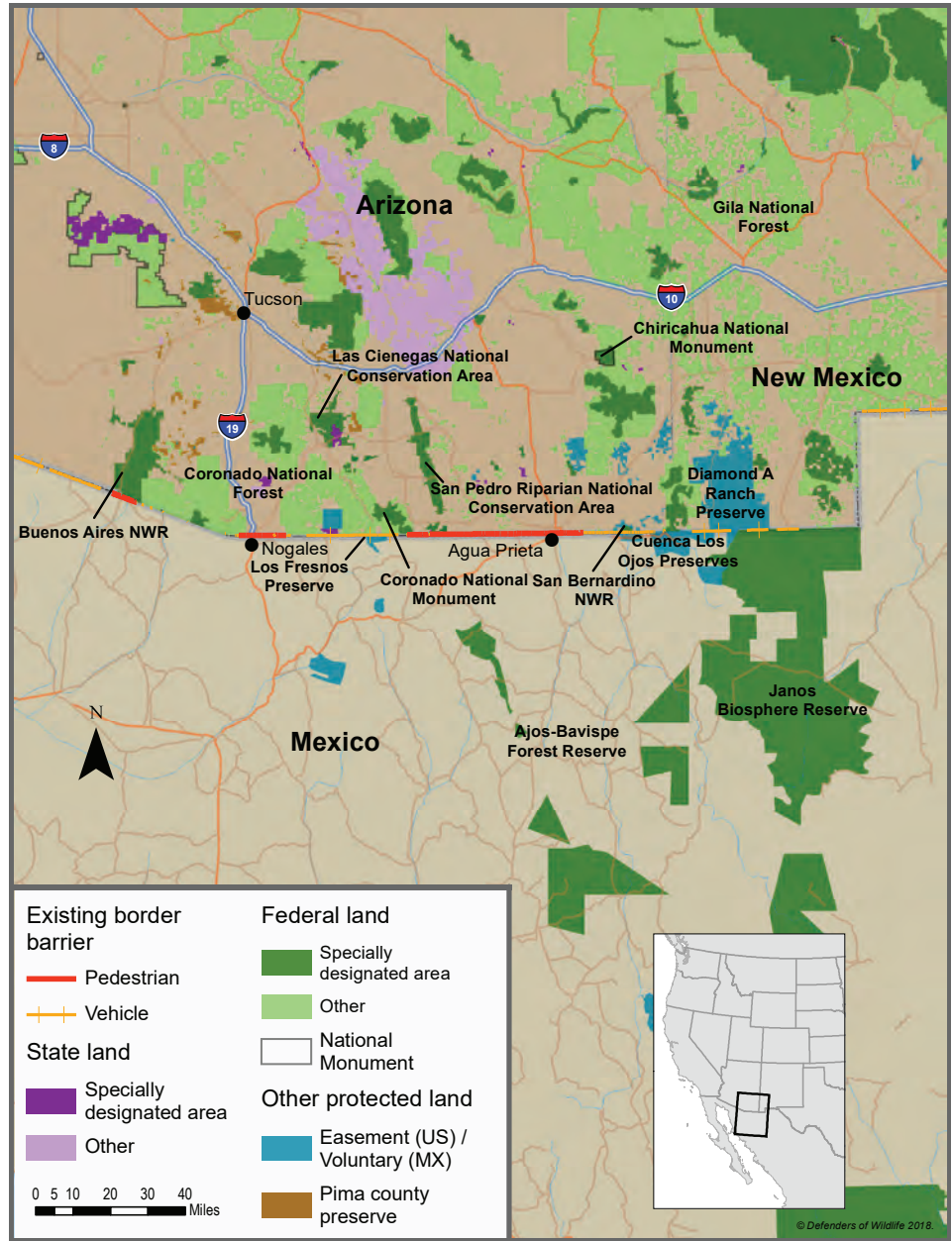


Figure 6. Protected areas in the Sky Islands



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BLM-managed Las Cienegas National Conservation Area encompasses grasslands, hills and cienegas—the spring-fed marshes that give it its name.

and research through its YES! Program (Cienega Watershed Partnership 2018).

Conservation collaborations

Meaningful conservation in the Sky Islands requires close cooperation between the United States and Mexico, in part because both countries are interested in restoring important predators like Mexican gray wolves in the United States and black-footed ferrets in Mexico. Binational efforts are underway to restore populations of predators and other species and to improve habitat management, research and training.

Restoring species

U.S. and Mexican wildlife agencies have established two small populations of Mexican gray wolves, one in Arizona and New Mexico and one in Chihuahua; long-range plans are for the two populations to converge. Last year at least two wolves from Mexico briefly crossed into the United States (Miller 2017). Agencies involved with Mexican gray wolf restoration include AGFD, FWS, U.S. Forest Service and Wildlife

Services, White Mountain Apache Tribe and Comisión Nacional de Áreas Naturales Protegidas (CONANP).

In 2013, the National Park Service (NPS), The Nature Conservancy and a coalition of Mexican partners reintroduced bison in the Janos Biosphere Reserve as part of a long-range plan to restore grasslands (Nature 2009). A second group of bison, the Janos-Hidalgo herd, travels freely back and forth across the border between Chihuahua and private ranchland in New Mexico (List 2017).

Some species are recolonizing on their own. A Mexican population of endangered black-tailed prairie dogs expanded across the border into the southwest corner of New Mexico, an area where poisoning had eradicated them (List 2007).

Other species-focused collaborations include a multi-million dollar project run by the University of Arizona that monitors jaguars and other border cats with trail cameras (University of Arizona 2017) and efforts by the FWS Mexico Program in Arizona, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) and other partners to protect wildlife in Sonora, Mexico, including imperiled

DEFENDING JAGUAR COUNTRY

Gooch Goodwin grew up in a ranching family with a father who was a renowned big cat hunter and a conservationist grandfather who believed even the maligned coyote had a place in the borderlands he ranched.

Right out of high school Goodwin started working for Animal Damage Control (now Wildlife Services), the arm of the U.S. Department of Agriculture charged with predator control, but the conservation ethic instilled by his grandfather soon took hold. He took a job as a fire lookout on an isolated mountaintop and became the environmental activist and jaguar advocate he is today.

Goodwin's family ranched in the Patagonia area, south of Tucson, where Mexican gray wolves still roamed when he was a boy. He also remembers his father killing a jaguar (before the U.S. population was protected under the Endangered Species Act) and hanging its hide on a wall at home.

Hoping to see jaguars—and wolves—back in the Sky Islands, Goodwin and his wife, Wendy Russell, joined with neighbors to form the Patagonia Area Resource Alliance. The group monitors the water flowing from abandoned mines and documents the presence of rare species like endangered Mexican spotted owls. With help from Defenders, the alliance stopped a mining

species like the longfin dace, red-spotted toad, flat-tailed horned lizard, masked bobwhite, cactus ferruginous pygmy-owl and Sonoran pronghorn. (Fernandez et al 2009).

Protecting habitat

“If we don't collaborate, we will keep losing populations, impoverishing the borderlands regions from a biological perspective” says Rurik List, ecology professor at the Universidad Autónoma Metropolitana-Lerma (List 2017). List started working with U.S. and Mexican partners in the early 1990s. He helped organize conservationists and scientists from both sides of the border to plan a United States to Mexico network of connected reserves. The Sky Island Alliance teamed up with partners to identify priority hotspots for conservation, including the area around Janos, Chihuahua, which is critical for bears, eagles and bison. Mexico



COURTESY OF GOOCH GOODWIN

Activists Gooch Goodwin and Wendy Russell

exploration project in critical borderlands habitat for jaguars. But Goodwin is worried. “If the wall is built,” he says, “it's all over for the jaguar in the United States.”

subsequently designated the area as biosphere reserve.

Mexico's Ajos-Bavispe Forest Reserve collaborates on bird monitoring, fire management research and environmental education with its official U.S. sister parks, the Chiricuhua and Coronado national monuments, managed by the National Park Service (NPS 2017a). With assistance from the Sky Islands Alliance, Coronado National Monument staff trained staff at Naturalia's Los Fresnos reserve just across the border on erosion and invasive species control.

Rallying ranchers

Knowing that ranchers are key to conservation in the borderlands, Rodrigo Sierra, a conservation biologist with Universidad Nacional Autónoma de México (UNAM), started raising cattle himself. “I had to know what I was talking about,” he says (Sierra 2017). He now has good



relationships with Janos ranchers, helping them develop sustainable grazing plans and restore wildlife habitat, which complements his work on recovering pronghorn, bison and prairie dogs in the Janos Biosphere Reserve. His research has already shown that well-managed prairie dog colonies improve forage for cattle.

Mexican researcher List made friends with ranchers in the Malpai Borderlands Group, Arizona landowners who want to manage their property well and preserve open space. Warner Glenn, a founding member of the group, has been a vocal champion of jaguars since the “God Almighty! That’s a jaguar!” moment he had in 1996 when he was hunting in the Peloncillo Mountains of the Sky Islands in Arizona and his hounds cornered a male jaguar (Gross 2015). Today, Warner and the other members of the Malpai group hold conservation easements on 78,000 acres on 15 ranches and cooperate with landowners across the border in Mexico (McDonald 2017, Barry 2017). These landowners use prescribed burning to restore grasslands and have constructed thousands of small check dams in gullies to retain water and restore vegetation in the San Bernardino Valley for jaguars, leopard frogs, long-nosed bats and ridge-nosed rattlesnakes (McDonald 2017).

A land-managing foundation

Conservation-minded Valer Clark and Josiah Austin set up a private foundation, Cuenca de Los Ojos, to conserve and restore land. They bought 25,000 acres eaten to bare dirt by cattle and proceeded to turn it around. So far, the foundation has re-seeded more than 5,000 acres of grassland, restored at least 15 percent of historical wetlands and returned year-round flows to six miles of once-dry rivers (Cuenca de Los Ojos 2017). On the U.S. side of the border, the foundation works on projects with the Arizona Malpai Borderlands Group and coordinates land management with adjacent San Bernardino National Wildlife Refuge. The refuge was created to recover endangered fishes in the Rio Yaqui Basin, including the Yaqui catfish, which no longer survive in natural populations in the United States because of water diversion and cattle grazing and is barely holding on in Mexico (NatureServe 2013).

In December 2017, Cuenca los Ojos hosted a meeting with World Wildlife Fund-Mexico that brought together some of the main players in the conservation of northern Mexico, including Universidad Nacional Autonoma de Mexico, The Nature Conservancy, Bird Conservancy of the Rockies, CONANP, Naturalia and PROFAUNA. Together they

“If we don’t collaborate we will keep losing populations, impoverishing the borderlands regions from a biological perspective.”

—*Rurik List, ecology professor at the Universidad Autónoma Metropolitana-Lerma*

developed objectives for protecting Chihuahuan grasslands (Sierra 2017).

The looming threat of the wall

Of the 362 miles Arizona shares with Mexico, 124 miles already have tall wall segments designed to exclude pedestrians. Another 183 miles have vehicle barriers, leaving only 55 miles of the Arizona-Mexico border with no barriers at all (U.S. Customs and Border Protection 2017). According to news reports based on an internal agency document, the Department of Homeland Security (DHS) plans 151 miles of new or improved barriers in Arizona (Carranza 2017).

Blocked wildlife movement. The best bet for long-term survival of jaguars and Mexican gray wolves in the Southwest is connecting U.S. and Mexican populations. Jaguars are now crossing from Mexico into Arizona through the mountains in areas with no wall or possibly places with just vehicle barriers (Figure 7). The flood plain where the San Pedro River flows north from Mexico is already bisected by pedestrian wall, and the river bed itself has Normandy-style vehicle barriers that are removed during the monsoon season to keep them from washing away. Robert Weissler, president of the Friends of the San Pedro, believes jaguars can enter the United States through gaps in these barriers, coming up the river and following one of its washes up into the mountains. “So you build a wall and obviously large critters like jaguars are going to be excluded,” he says. (Dayton 2017) This includes ocelots, also occasionally seen in the Sky Islands borderlands.

As for Mexican gray wolves, scientists conclude that a healthy population should number at least 750, seven times more than currently in the U.S. wilds (Defenders et al 2014). An additional 30 some wolves live in Mexico not far from the border. In 2017, two of them, a male and female, crossed briefly into Arizona and New Mexico (Miller 2017). Fortunately, there are still large expanses of potential habitat for wolves on federal and tribal lands

“If the wall is built, it’s all over for the jaguar in the United States.”

—Gooch Goodwin, *Patagonia Area Resource Alliance*

in the Sky Islands landscape, including the Gila and Coronado national forests (Peters 2017).

The ultimate recovery vision is to connect these Mexican and U.S. wolves via protected corridors. Completing the wall would preclude this possibility, undercutting millions of dollars already spent on wolf recovery in both countries.

Even some relatively common animals like coatis are disturbed by the wall—a 2011 study found lower densities of mountain lions and coatis in border areas near wall segments (Evans Ogden 2017). The wall would also disrupt a cross-border population of black bears. A 2011 genetic study showed that black bears in southern Arizona are more closely related to Mexican bears than to bears in central Arizona (Atwood et al 2011). These border bears are a single population, and completion of a border wall would split it in two.

Some birds also could be blocked. A study of the imperiled cactus ferruginous pygmy-owl, scattered in remnant populations that have woodlands and saguaro cactuses, concluded that it would be unlikely to cross the wall because it flies so low to the ground (Flesch and Steidl 2007, Flesch et al 2010, Evans 2017).

Hurdle to binational cooperation. Existing border barriers and associated militarization already make conservation more difficult. Rurik List says that 15 years ago Mexican conservation staff and scientists could cross the border from

Janos to visit neighboring U.S. ranches without much trouble, but it has become more difficult. “Now it’s hard to monitor effects of the border wall directly,” says List. According to Sky Islands Alliance biologist Mirna Manteca, “U.S. National Park Service staff can’t easily visit the Mexican parks, and it’s hard for Mexican officials to come to the U.S. for training, making these long-term cooperative projects difficult.” But she is optimistic about one thing: “There’s lots of interest in partnering up and uniting against the wall,” she says” (Manteca 2017).

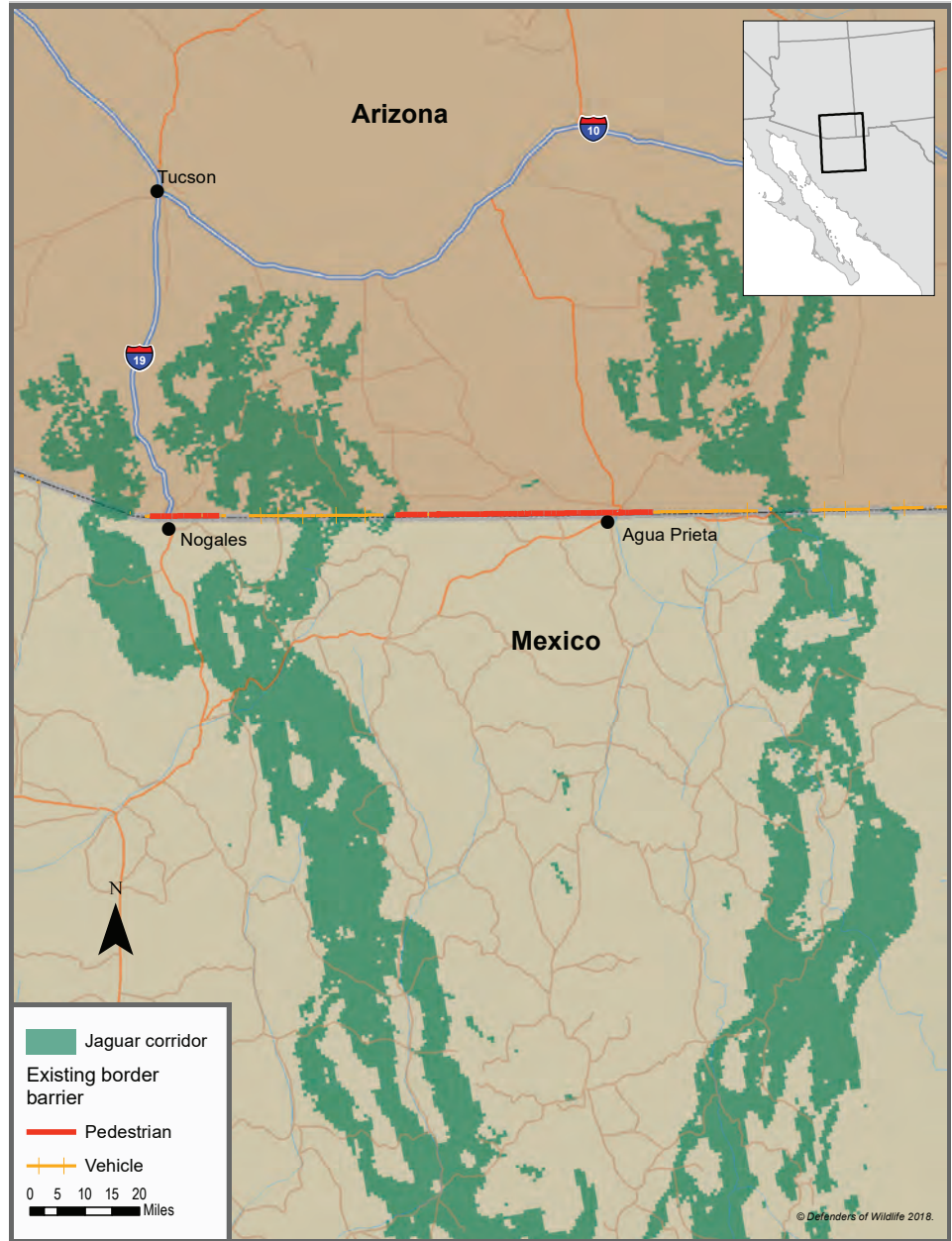


Figure 7. Potential jaguar connectivity in the Sky Islands



JIM CLARK/FWS

Completing the border wall would undercut the millions of dollars already invested in Mexican gray wolf recovery by the United States and Mexico.

Diversion of funds. Money spent on the wall is money not spent on conservation. The National Fish and Wildlife Foundation (NFWF) estimates that it would cost \$265 million to restore populations of key species like black-tailed prairie dogs and the grasslands, wetlands and other habitat they need in the U.S. and Mexican Sky Island landscape (NFWF 2009). That is roughly the cost of building 10 miles of border wall at \$25 million per mile.

Undercutting conservation investments. As documented in the previous section on conservation collaborations, agencies, nonprofits and private citizens have significant investments in Sky Island conservation that the wall could jeopardize. Existing sections of wall already cut through the Lower San Pedro Valley, where more than 50 million dollars has been invested to protect over 200,000 acres (Tucson Audubon 2015). The Sky Islands Restoration Cooperative spent \$2,874,000 on restoration projects in 2015 and valued volunteer contributions at a minimum of \$191,000 (Sky Island Restoration Cooperative 2015).

Impact on ecotourism and aesthetic values. The wall could decrease income generated by ecotourism and the natural

amenities that draw people to live and recreate in scenic, biologically rich places. Over the last half century, the Sky Islands town of Patagonia shifted from mining to ecotourism with an increase in sales tax revenue of 364 percent, corrected for inflation (Shafer 2014). “Eighty-five percent of our business is from visitors to the Patagonia Mountains who come here to enjoy birding, hunting, camping, cycling, hiking and other outdoor recreational activities,” says Carolyn Shafer, owner of an art gallery in Patagonia (Shafer 2014). Only 15 miles from the border, the town is likely to take an economic hit if the wall and intimidating border security activities keep tourists away.

According to a 2012 study, within two years of opening a border checkpoint on Interstate 19 significantly depressed real estate values in the tourism-dependent communities of Rio Rico and Tubac, Arizona, located just south of the checkpoint, compared with communities north of the checkpoint. Although more difficult to quantify, the study reported that “business representatives to the south of the checkpoint were unequivocal in their views that there has been, in fact, a decline in tourism in the region as a result of the checkpoint (Gans 2012).”