

Mastozoología Neotropical  
U.S. Department of Commerce  
mnsarem@lab.cricyt.edu.ar  
ISSN (Versión impresa): 0327-9383  
ISSN (Versión en línea): 1666-0536  
ARGENTINA

2007

Melissa Grigione / Alison Scoville / Gerald Scoville / Kevin Crooks  
NEOTROPICAL CATS IN SOUTHEAST ARIZONA AND SURROUNDING AREAS:  
PAST AND PRESENT STATUS OF JAGUARS, OCELOTS AND JAGUARUNDIS  
*Mastozoología Neotropical*, julio-diciembre, año/vol. 14, número 002  
U.S. Department of Commerce  
San Miguel de Tucumán, Argentina  
pp. 189-199

Red de Revistas Científicas de América Latina y el Caribe, España y Portugal

---

Universidad Autónoma del Estado de México

<http://redalyc.uaemex.mx>



# NEOTROPICAL CATS IN SOUTHEAST ARIZONA AND SURROUNDING AREAS: PAST AND PRESENT STATUS OF JAGUARS, OCELOTS AND JAGUARUNDIS

---

Melissa Grigione<sup>1</sup>, Alison Scoville<sup>2</sup>, Gerald Scoville<sup>2</sup>, and Kevin Crooks<sup>3</sup>

<sup>1</sup> Dept of Biology, Grad program in Env Science, Pace University, 861 Bedford Road, Pleasantville, NY 10570 <mgrigione@pace.edu>. <sup>2</sup> Biology Department, Utah State University, 5305 Old Main Hill, Logan, UT 84322-5305. <sup>3</sup> Department of Fish, Wildlife, and Conservation Biology, 115 Wagar, Colorado State University, Fort Collins, CO 80523.

**ABSTRACT:** There are three species of neotropical cats for which the northern limit of their distribution reaches the border region of the U.S. and Mexico: the jaguar (*Panthera onca*), ocelot (*Leopardus pardalis*), and jaguarundi (*Herpailurus yaguarondi*). Due to their low population densities, small total numbers, and secretive habits, all three species are difficult to observe. To ensure long-term survival for neotropical cats in the region, it is imperative to identify current distribution and status in the northern limits of their range. We assessed the status of three rare neotropical felids, the jaguar (*Panthera onca*), ocelot (*Leopardus pardalis*), and jaguarundi (*Herpailurus yagouaruni*), in the Chiricahua and Peloncillo Mountains of southeastern Arizona where recent sightings of all three species have taken place. Study techniques included interviews and collection of unpublished and published species-sighting records, which yielded data on all three carnivores. Although jaguars and ocelots historically have occupied southeastern Arizona, we found no recent evidence of a resident, reproducing population. Recommendations are made regarding what measures are necessary to promote neotropical cat conservation in this region.

**RESUMEN:** Gatos neotropicales en el sudeste de Arizona y alrededores: estatus pasado y presente de los jaguares, ocelotes y yaguarundíes. Existen tres especies de gatos neotropicales para los cuales el norte de su distribución alcanza la frontera entre Estados Unidos de Norteamérica y México: el jaguar (*Panthera onca*), el ocelote (*Leopardus pardalis*), y el yaguarundí (*Herpailurus yaguarondi*). Debido a sus bajas densidades poblacionales, su bajo número total de individuos, y sus hábitos sigilosos, estas especies son difíciles de observar. Para asegurar su supervivencia a largo plazo en la región, es fundamental identificar sus distribuciones actuales y su estatus en los límites norte de sus rangos de distribución. Nosotros hemos revisado el estatus de estas tres raras especies en las Montañas de Chiricahua y Peloncillo al sudeste de Arizona donde recientemente se registraron avistajes. Las técnicas de estudio incluyeron entrevistas y recopilación de registros de avistajes publicados y no publicados, lo que permitió acumular información sobre las tres especies. Aunque los jaguares y ocelotes han ocupado el sudeste de Arizona en épocas pasadas, nosotros no hemos encontrado evidencias recientes de poblaciones residentes o reproductivas. Se hacen recomendaciones respecto de las medidas que se necesitan para promover la conservación de esos gatos neotropicales en la región de estudio.

**Key words.** Borderland. Jaguar. Jaguarundi. Neotropical. Ocelot.

**Palabras Clave.** Fronteras. Jaguar. Neotropico. Ocelote. Yaguarundí.

## INTRODUCTION

Three species of neotropical felids, the jaguar (*Panthera onca*), ocelot (*Leopardus pardalis*), and jaguarundi (*Herpailurus yagouaruni*), have been recorded periodically in the state of Arizona from the mid-1800s to the present. However, only a few sightings of two of the species, the jaguar and ocelot, have been confirmed by a verified specimen or photograph, and the status of all three species within the state remains in question. Because of their low density and solitary, secretive nature, little is known about their population size, current range, or habitat requirements in the southwest United States (Nowell and Jackson, 1996; Grigione et al., 2001). At present, there are approximately 100 ocelots in Texas (Laguna Atascosa National Wildlife Refuge and surrounding ranches) and no known populations of jaguars or jaguarundis in the U.S. (Grigione et al., 2001).

Jaguars historically occurred from the southern United States to Argentina but have since experienced range contractions, primarily in Mexico and the United States in the north and in Brazil and Argentina in the south (Nowell and Jackson, 1996). Jaguars are excellent swimmers and in the neotropics are usually associated with closed canopy forest and permanent water sources below 1200 m. In Mexico, however, this species occupies scrub, chaparral, oak, and oak-pine forests between 500 and 2700 m in altitude (Brown and López González, 2000; Brown and López González, 2001; López González, 2003). In Sonora and southern Arizona and New Mexico, jaguars have been recorded in Sonoran desert scrub, shrub-invaded semidesert, riparian areas, tropical deciduous thorn forest, and montane oak and oak-pine forests (Brown and López González, 2000; Brown and López González, 2001; López González, 2003).

The known range of the ocelot extends from the southern United States south into Paraguay and northern Argentina (Nowell and Jackson, 1996). Populations of the Sonoran ocelot are isolated from the Texas ocelot, which ranges from the foothills of the Sierra Madre

Orientalis in Coahuila north into Texas, by the Sierra Madre highlands (USFWS, 1990). Like the jaguar, ocelots inhabit diverse habitats, including montane forest, thick brush, semi-desert, riparian areas, semi-arid thorn scrub, tropical dry forest, and rainforest (Emmons, 1987; Emmons et al., 1989; Bisbal, 1989; USFWS, 1990; Kitchener, 1991; Nowell and Jackson, 1996). Ocelots do not inhabit the desert scrub of western Sonora (USFWS, 1990), nor are they found in open country (Kitchener, 1991), although they occasionally use the more open palm savanna and sandhills of Venezuela (Sunquist et al., 1989).

Jaguarundis inhabit extreme southern regions of Texas (Davis, 1974; Hall, 1981; USFWS, 1990; Girmendonk, 1994), but their distribution within Central and South America is not well known (Girmendonk, 1994). Like jaguars and ocelots, jaguarundis inhabit a diverse array of habitats, including lowland forests and thickets (Kitchener, 1991), tropical dry forest (Bisbal, 1989), riparian habitat, and abandoned agricultural fields (Konecny, 1989). They are not closely related to any of the other small neotropical cats, having descended from ancestors that probably evolved in Europe before colonizing the Americas via the Bering land bridge, arriving at approximately the same time as cougars (*Puma concolor*) (Werdelin, 1985).

All three neotropical cat species have been placed on the United States Endangered Species List, although the recovery plan for the ocelot and jaguarundi does not outline critical habitat for either species (USFWS, 1990). The ocelot has also been protected by a mandate of the Arizona Game and Fish Commission since 1970, although it is not included in the Arizona List of Threatened Native Wildlife. The IUCN List of Threatened Species (2007) lists the jaguar as "near threatened."

A study was initiated to investigate the status of these three neotropical felids in Arizona, focusing on the Chiricahua and Peloncillo Mountains of Cochise County, southeastern Arizona, where recent sightings of all three species have occurred. Although somewhat isolated, both mountain ranges are

northern extensions of the Sierra Madre Mountains of Mexico, and may thus be in a position to receive felid immigrants from established populations to the south. During the course of this study data were also obtained from neighboring communities in western New Mexico and northern Sonora (Mexico).

## METHODS

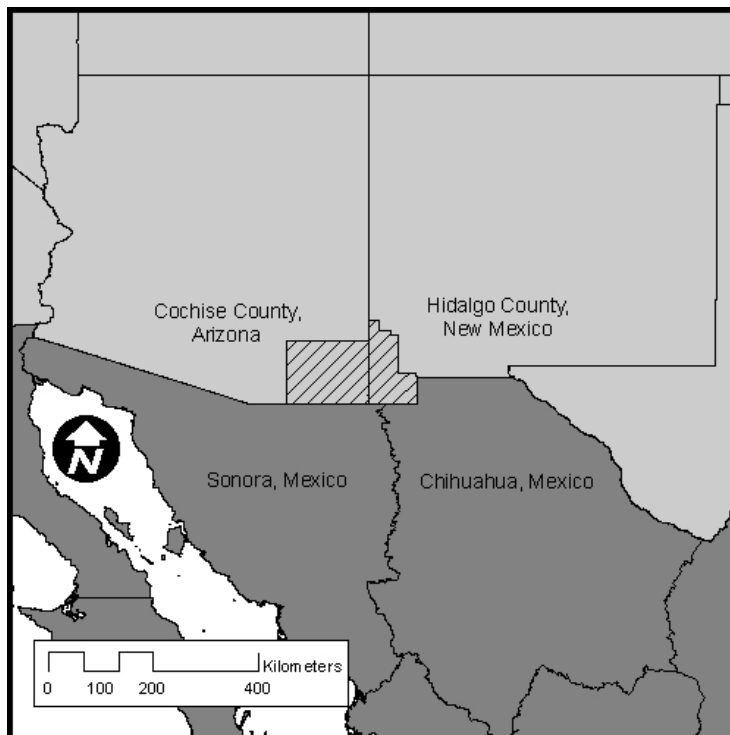
### Study area

The Chiricahua and Peloncillo mountains of southeastern Arizona form part of the Madrean “sky islands”— isolated ranges that extend disjointedly north from their center in the Sierra Madre of Mexico. Elevational relief, diverse underlying geology, location near the edge of the Chihuahuan desert, and a history of climate change over geological time have produced a complex and diverse mosaic of distinct biotic communities (**Fig. 1**; Gehlback, 1993; Brown, 1994). These particular sky is-

lands support primarily interior chaparral and Madrean evergreen woodlands, surrounded by a matrix of semidesert grassland and Chihuahuan desertscrub (for biotic community descriptions, see Brown, 1994). Madrean montane coniferous forests dominate above approximately 2300 m, and long, sinuous tongues of deciduous riparian forest exist wherever drainages provide predictable subsurface flow during winter and spring. Although semidesert grasslands supported primarily perennial grasses and sparse scrub at the time of European contact, heavy grazing and fire suppression have allowed widespread invasion by shrubby species, creating a short-statured chaparral.

### Historical records and interviews

Historical information on neotropical felids was gathered from previously unpublished Arizona and New Mexico Game and Fish records as well as published literature. For more recent information, we directly inter-



**Fig. 1.** Map of Study Area (hatched lines) in Arizona and New Mexico, USA.

viewed local cougar hunters, governmental agency employees, biological researchers, and local residents who reported sightings of neotropical felids. Specifically, information was gathered concerning cat sightings within or near the Chiricahua, Peloncillo, and Pedregosa Mountains, as well as the Fort Bowie National Historic Site, Cochise County, Arizona. The Chiricahua National Monument Archives yielded eight accounts of jaguarundi sightings and one account of an ocelot sighting, and U. S. Forest Service employees described additional possible sightings. Staff at the American Museum of Natural History's Southwest Research Station in Portal provided names of researchers as well as local people who reported sightings of neotropical cats in the area. Informants who believed they had seen jaguars, ocelots, or jaguarundis were contacted and interviewed in order to obtain detailed information, including the observer's level of wildlife expertise, sighting date and time, sighting location, weather during sighting, description of the encounter, description of the cat, and quality of sighting. All record searches and interviews were conducted between March 1 and May 21, 1999.

## RESULTS

### Jaguars

Of the three neotropical felid species examined in this study, jaguars yielded the most convincing evidence for a historical resident population in Arizona and adjacent New Mexico. Between 1848 and 1998, Arizona Game and Fish received 69 reports of jaguars in Arizona. Using the system developed by Girmendonk (1994), 16 of these records are classified as confirmed (i.e., an animal in the hand or photographed) and 20 reports are classified as reliable (**Table 1**; Girmendonk, 1994; Pruss, 1999). In 1996, New Mexico Game and Fish received 58 reports of jaguars killed or photographed in Arizona and New Mexico between 1900 and 1996, but did not rate these records according to reliability or location (i.e. only the county of each record was noted). At

least 12 of the New Mexico Game and Fish reports appear to be additional to Arizona Game and Fish records but differences in the format of Arizona and New Mexico Game and Fish records make it unclear how many of the remaining reports are duplicates.

Most reports do not specify the sex of the jaguar, but the New Mexico Game and Fish (unpublished report of 1996) lists six female jaguars, including two with young. Four of these reports are closely matched by Arizona Game and Fish records, which classify one as confirmed and two as unreliable. The third, from 1919, is not classified, but the skull and skin have been deposited in the National Museum of Natural History, Washington, D.C. (**Table 1**). In addition to reports in Arizona and New Mexico Game and Fish records, Hoffmeister (1986) cites reports of a female and two kittens in the Grand Canyon between 1889 and 1900, as well as a female and young killed in Coconino County, Arizona in 1900 (**Table 1**). Our interviews yielded one jaguar report from a long-time mountain lion dog trainer and hunter in the area, who discovered some possible jaguar tracks near the Rustler Park Campground in the Chiricahua Mountains. The tracks were well-cast in light snow, and were seen in the winter of 1989-1990 (**Table 1**; Louis Pope, pers. comm.).

### Ocelots

Evidence for historical populations of ocelots in Arizona is scarce. The earliest historical ocelot report in Arizona was from Fort Verde, Yavapai County, where Edgar Mearns collected a skin in 1887 and gave it to the U.S. National Museum in Washington, D.C. (**Table 2**). It is unclear, however, if the cat was killed in Yavapai County or merely obtained there (Hoffmeister, 1986). In 1931-1932, another ocelot was killed by a predator control trapper near Camp Verde, Arizona, and a third was killed by a cougar hunter near Patagonia in 1960 (**Table 2**; Hoffmeister, 1986). The Arizona Game and Fish Department has received three additional, confirmed reports and four reliable observations from Arizona between 1900 and 1998, as well as

**Table 1**  
Jaguar Sightings in Arizona/USA and Sonora/Mexico

DATE OBSERVED	AREA	COUNTY/STATE/COUNTRY	EVIDENCE
1998	Tumacacori Mountains	Santa Cruz/AZ/USA	Observation
1998	Patagonia	Santa Cruz/AZ/USA	Observation
1998	Pena Blanca Lake	Santa Cruz/AZ/USA	Observation
1998	Hereford	Cochise/AZ/USA	Observation
1997	Garden Canyon/Huachuca Mts	Cochise/AZ/USA	Observation
1997	Cerro Colorado Mts	Pima/AZ/USA	Observation
1996	Baboquivari Mountains	Pima/AZ/USA	Observation/Videotape
1996	Peloncillo Mountains	Cochise/AZ/USA	Observation/Photograph
1993	Exact Location Unknown	Pima/AZ/USA	Observation/Deer Kill
1993	Exact Location Unknown	Cochise/AZ/USA	Observation
1991-93	Exact Location Unknown	Sonora/MEX	Mortality
1991-93	Exact Location Unknown	Cochise/AZ/USA	Mortality
1989-90	Rustler Park Campground/ Chiricahua Mts	Cochise/AZ/USA	Tracks in Snow
1988	Exact Location Unknown	Pima/AZ/USA	Observation/Tracks
1988	Exact Location Unknown	Pima/AZ/USA	Observation
1986	Doz Cabezos Mountains	Cochise/AZ/USA	Mortality
1971	Exact Location Unknown	Santa Cruz/AZ/USA	Skull
1965	Exact Location Unknown	Santa Cruz/AZ/USA	Skull
1964	Fort Apache Indian Reservation	Gila/AZ/USA	Skull
1963	White Mountains	Apache/AZ/USA	Mortality
1961	Exact Location Unknown	Cochise/AZ/USA	Mortality
1959	Exact Location Unknown	Santa Cruz/AZ/USA	Mortality
1959	Exact Location Unknown	Santa Cruz/AZ/USA	Mortality
1958	Exact Location Unknown	Santa Cruz/AZ/USA	Mortality
1949	Cerro Colorado, Near Arivaca	Pima/AZ/USA	Mortality
1941	Exact Location Unknown	Pima or SantaCruz/AZ/USA	Mortality
1933	Exact Location Unknown	Santa Cruz/AZ/USA	Mortality
1926	Cypress Mountain	Yavapai/AZ/USA	Mortality
1926	Nogales	Santa Cruz/AZ/USA	Skull
1924	Cibecue	Navajo/AZ/USA	Skull/Skin
1919	Greaterville	Pima/AZ/USA	Skull/Skin
1917	Helvetia	Pima/AZ/USA	Skull/Skin
1912	Chiricahua Natl Monument	Cochise/AZ/USA	Mortality
1909	Foothills of Sierra Madre	Sonora/MEX	Skull
1903	Exact Location Unknown	Santa Cruz/AZ/USA	Mortality
1902	Rincon Mountains	Pima/AZ/USA	Mortality
1900	Exact Location Unknown	Coconino/AZ/USA	Mortality
1899-1900	Grand Canyon	Coconino/AZ/USA	Observation

**Table 2**  
Ocelot Sightings in Arizona/USA and Sonora/Mexico

DATE OBSERVED	AREA	COUNTY/STATE/COUNTRY	EVIDENCE
1998	Tumacacori Mountains	Santa Cruz/AZ/USA	Observation
1998	Sabino Canyon Rd-Kolb Road Intersection. NE Tucson.	Pima/AZ/USA	Observation
1996	Echo Canyon Trail, Chiricahua Natl Monument	Cochise/AZ/USA	Observation
1970	Rio Yaqui	Sonora/MEX	Hunter/Trapper Take
1970	Arizpe	Sonora/MEX	Hunter/Trapper Take
1966	Sierra Azul Mountains	Sonora/MEX	Hunter/Trapper Take
1964	Pat Scott Peak, Huachuca Mts	Cochise/AZ/USA	Hunter/Trapper Take
1964	Exact location unknown	Cochise/AZ/USA	Hunter/Trapper Take
1963	Exact location unknown	Graham/AZ/USA	Observation
1960	Patagonia	Santa Cruz/AZ/USA	Hunter/Trapper Take
1931-32	Campe Verde	Yavapai/AZ/USA	Hunter/Trapper Take
1900	Exact location unknown	Pima/AZ/USA	Skull
1887	Fort Verde	Yavapai/AZ/USA	Skin

three reliable observations from Sonora, Mexico from 1966 to 1970 (**Table 2**; Pruss, 1999). From these data, the last confirmed account of an ocelot in Arizona was in 1964 (**Table 2**; USFWS, 1990). At least some of these reports of ocelots may be due to escaped or released captives (Glenn, 1996). For example, Pruss (1999) reports that ocelots were transported from Mexico into Arizona in the early 1970s by a trapper who kept them in Carmen, Arizona. Alternatively, individual cats may have dispersed into Arizona via corridors of tropic-subtropical vegetation, particularly in the Rio Yaqui and Rio San Miguel drainages (USFWS, 1990). In addition, trappers in Arizona may have been reluctant to report incidental trapping of ocelots, particularly after this species was protected by an order of the Arizona Game and Fish Commission in 1970. Because of this, state records may not necessarily reflect the number of ocelots captured or killed. Our interviews recorded only two recent reports of ocelot sightings from the area, neither one of which provides an in-depth description. One was seen by four hikers in the Chiricahua National Monument in March of 1986. The other was a possible ocelot seen

dead on the road by a Southwest Research Station employee in 1972, although he did not collect the carcass for positive identification. The reliability of these reports are questionable; hence, these sightings have not been added to **Table 2**.

### Jaguarundis

Of the three neotropical felids discussed here, jaguarundis are the least understood. Between 1938 and 1998, the Arizona Game and Fish received 33 reliable sightings in Pima, Cochise, Maricopa, and Santa Cruz counties, but no confirmed reports (**Table 3**; Girmendonk, 1994; Pruss, 1999). Pruss (1999) also writes that local residents in the early 1900s often saw cats in the southeast end of the Santa Rita Mountains that were different from mountain lions and bobcats and fit the description of jaguarundis.

Our interviews yielded 21 accounts from people who believe they have seen jaguarundis between 1974 and May 1999. Six of the 21 sightings were reported by professional field biologists and two by wildlife artists; three of these eight sightings were reported by people who are familiar with the species, having pre-

viously seen jaguarundis in Texas or kept them as pets (**Table 3**). Reports include jaguarundis of both color phases, seen both during the day and at night, often described with great detail and accuracy. Because we learned of these sightings somewhat serendipitously, by talking to people in town and following up on potential leads, there almost certainly are additional sightings of which we are unaware.

## DISCUSSION

The number of female jaguars with young historically recorded in Arizona suggests that there was once a resident, breeding population in the state. This assertion, supported by the number of jaguars killed in Arizona between 1900 and 1979, is indicative of an over-exploited population, rather than an irregular pattern indicative of immigrants from Mexico (Brown 1983, 1997). It is likely that jaguar populations in the United States declined greatly under pressure from state and federal predator control programs, as well as private livestock producers, who indiscriminately killed predators. Additional pressure may have come from the decline of prey populations as well as severe degradation of riparian areas and other habitat due to intensive grazing in the late-1800s and 1900s. In recent years, vast areas have been cleared of vegetation and planted with African buffel grass, creating a monoculture of little value to wildlife (Bowden, 1993). In Sonora, desertscrub and thornscrub of much of the coastal plain has been removed to make way for irrigated districts, and the riparian gallery forests of cottonwood (*Populus* spp.), walnut (*Juglans* spp.), and sycamore (*Platanus wrightii*) that once marked the routes of permanent rivers are severely degraded or nearly gone (Brown, 1985; Martinez and Valdez, 1998; Russell and Monson, 1998).

Therefore, breeding populations of jaguars appear to have been exterminated from Arizona and New Mexico. Most jaguars recorded in the southwestern United States since the 1950s have been male, and many were seen within 25 miles of the Mexican border, suggesting that they were vagrants from Mexico

(Brown, 1991). There have been reports of at least 62 jaguars killed in northwestern Mexico since 1900, 22 of them since 1989, including at least six females (three of which were lactating; Brown and López González, 2001). Additionally, five adult jaguars were killed in northeastern Sonora in 1997 and 1998, primarily due to livestock predation (Martinez and Valdez, 1998). Of these five jaguars, four were females, including one with two kittens and another with swollen nipples at the time she was poisoned. It is unclear if these two data sets overlap; however, the presence of lactating females is indicative of a breeding population in northern Sonora.

The current and historical status of ocelots and jaguarundis in Arizona remains unclear. Evidence for historical occupation is scant for both species, including only seven confirmed reports of ocelots between 1900 and 1999, and no confirmed reports of jaguarundis during this time period. Despite extensive trapping of bobcats throughout this area, particularly in the 1970s (Glenn, pers. comm.) neither neotropical species has reportedly been caught; this may reflect low abundance or absence of neotropical cats, or differences in habitat use and behavior that render them less susceptible to trapping. This area has also been heavily hunted using cougar hounds, which pursue the scent of any type of felid (Glenn, pers. comm.), and yet we recorded no hunter reporting an encounter with either of the small neotropical cats. However, hunters are less likely to pursue a trail that, because of behavior or track size, does not appear to be a cougar. In addition, numerous detailed, credible reports of jaguarundis and several reports of ocelots in the state indicate that further investigation is warranted.

While all three species are protected as endangered by the U.S. Endangered Species Act and Mexican legislation (NOM-059-2001), future establishment of neotropical cats in the U.S. will depend upon immigration from source populations in Mexico. Therefore, it is essential that potential source populations of jaguars, ocelots and jaguarundis be located and potential travel routes to habitat in the United

**Table 3**  
 Jaguarundi Sightings in Arizona/USA and Sonora/Mexico

DATE OBSERVED	AREA	COUNTY/STATE/COUNTRY	EVIDENCE
1998	Tumacacori Mountains	Santa Cruz/AZ/USA	Observation
1998	Santa Rita Mountains	Pima/AZ/USA	Observation
1998	Whetstone Mountains	Cochise/AZ/USA	Observation
1998	Northwest Whetstone	Cochise/AZ/USA	Observation
1998	Canelo Hills	Santa Cruz/AZ/USA	Observation
1998	Canelo Hills	Santa Cruz/AZ/USA	Observation
1998	Chiricahua National Monument	Cochise/AZ/USA	Observation
1998	Chiricahua National Monument	Cochise/AZ/USA	Observation
1997	Sabino Canyon/Coronado Natl Forest	Pima/AZ/USA	Observation
1997	Chiricahua Mountains	Cochise/AZ/USA	Observation
1996	Amado	Santa Cruz/AZ/USA	Observation
1996	Green Valley	Pima/AZ/USA	Observation
1996	Chiricahua Mountains	Cochise/AZ/USA	Observation
1996	Chiricahua Mountains	Cochise/AZ/USA	Observation
1994	Chiricahua Mountains	Cochise/AZ/USA	Observation
1993-94	Chiricahua Mountains	Cochise/AZ/USA	Observation
1993	La Reserve	Pima/AZ/USA	Observation
1993	Fort Bowie National Historic Site	Cochise/AZ/USA	Observation
1992	Exact location unknown	Pima/AZ/USA	Observation
1991	Exact location unknown	Cochise/AZ/USA	Observation
1991	Exact location unknown	Cochise/AZ/USA	Observation
1991	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1990	Exact location unknown	Cochise/AZ/USA	Observation
1989	Chiricahua Mountains	Cochise/AZ/USA	Observation
1988	Exact location unknown	Pima/AZ/USA	Observation
1987-88	Exact location unknown	Cochise/AZ/USA	Observation
1986	Chiricahua Mountains	Cochise/AZ/USA	Observation
1985-86	Exact location unknown	Maricopa/AZ/USA	Observation
1984	Chiricahua Mountains	Cochise/AZ/USA	Observation
1983	Exact location unknown	Pima/AZ/USA	Observation
1982-83	Exact location unknown	Cochise/AZ/USA	Observation
1982	Alamos	Sonora/MEX	Observation
1982	Exact location unknown	Cochise/AZ/USA	Observation
1982	Exact location unknown	Cochise/AZ/USA	Observation

(Table 3, cont.)

DATE OBSERVED	AREA	COUNTY/STATE/COUNTRY	EVIDENCE
1982	Exact location unknown	Pima/AZ/USA	Observation
1981	Exact location unknown	Pima/AZ/USA	Road Kill/Unrecovered
1975	Exact location unknown	Santa Cruz/AZ/USA	Observation
1975	Exact location unknown	Santa Cruz/AZ/USA	Observation
1955	Exact location unknown	Pima/AZ/USA	Observation
1936	Coronado Natl Forest Huachuca Mountains	Santa Cruz/AZ/USA	Observation

States be identified (Grigione et al., In Prep). Both montane corridors (Brown and López González, 2001) and riparian areas (Martinez and Valdez, 1998) appear to be important jaguar travel routes. The USFWS (1990) suggests that subtropical riparian forest along drainages in the Rio Yaqui, Rio Mayo, Sonora, San Miguel and San Pedro River Valleys may provide corridors through which felids can move into the United States. However, the extensive mesquite bosques along the San Pedro River, as well as other potential travel routes, are being rapidly cleared both north and south of the border (Brown, 1985; USFWS, 1990). Recent proposals to erect hundreds of kilometers of fences and roads across the U.S.-Mexico border in order to stop illegal crossings into the U.S. will disrupt important corridors for neotropical cats and disturb fragile ecosystems (Marris, 2006).

Because of deforestation, as well as indiscriminate killing by the livestock industry throughout its range (Crawshaw and Quigley, 1991; Hoogesteijn and Mondolfi, 1993), jaguar populations exist in only 33% of their historical range in Mexico and Central America, and in areas that still have jaguars, 75% of the populations exist in reduced numbers (Rabinowitz, 1995). Whether the smaller neotropical cat species have reduced distributions is unknown since reliable information is scarce. Hence, further investigation of possible populations of neotropical felids, especially jaguarundis and ocelots, is a priority in the border region. Efforts should include: continued interviews and compilation of sighting

records; field surveys for neotropical cats both in northern Mexico where source populations may exist, as well as in areas in the southwestern United States where most sightings have occurred; and development of predictive habitat and movement models for the three species to identify and protect likely core habitat areas and recolonization routes. Towards this end, a recent GIS-based habitat mapping workshop was convened where 29 scientists and conservationists working in the border region contributed important information about the distribution and status for each species. During this workshop, focal areas for future research and conservation measures were identified for each species (Grigione et al., In Prep).

Conservation for these northernmost populations is imperative. Indeed, the border region has been identified as a major hotspot for biodiversity, high species richness, endemic and threatened species, and peripheral populations (Ceballos, 1997; Ceballos et al., 2005). Local populations of species are essential to maintaining the structure and function of regional ecosystems (Terborgh et al., 2002) and genetic considerations for conserving peripheral populations of a species are well established (Young and Clarke, 2000).

Worldwide, such biologically diverse "hot spots" have prompted creation of international reserves, enabling adjacent countries to maintain invaluable biological features (Kappelle and Juarez, 1994; Konstant and Mittermeier, 2002). Binational conservation along the U.S.-Mexico border has played an important role for the conservation of threatened species

(Ceballos, 1997) like the Sonoran pronghorn (*Antilocapra Americana sonorensis*), bighorn sheep (*Ovis canadensis*), thick-billed parrot (*Rhynchopsitta pachyrhyncha*) and black-tailed prairie dog (*Cynomys ludovicianus*). The importance of trans-boundary conservation cannot be overemphasized for felids and other species. For example, areas depleted in black bears in western Texas were re-colonized with protected bear populations from the Serranias del Burro in Coahuila (Medellin et al., 2005).

Neotropical cats in the border region are "Flagship Species" that continue to unite people from different states, countries, and livelihoods. Cat conservation in the border region presents an opportunity for collaboration that would counterbalance current efforts to make the border impermeable to both people and wildlife.

## ACKNOWLEDGMENTS

We wish to express our sincere thanks to Les Dufour for Coronado National Forest special use permits, Allan Whalon for access to the Chiricahua National Monument archives, Staff at the American Museum of Natural History's Southwest Research Station in Portal for providing names of researchers, as well as local people who reported sightings of neotropical cats in the area, and to all observers who consented to be interviewed — especially those who sent written accounts — including cougar hunters Warren Glenn and Louis Pope. Special gratitude is extended to Don and Janey Hoffman, Dr. Bruce Baizel, Dennis Sizemore, Doug and Andrea Peacock, Round River Conservation Studies (RRCS) founders and advisors, Don Jones — RRCS assistant, and to Caroline Christy, Beth Lewis, and Stefanie Vassilicos — RRCS students. RRCS and Defenders of Wildlife are thanked for financial support of this project. Peter Reehling is thanked for developing maps for this manuscript.

## LITERATURE CITED

- BISBAL FJ. 1989. Distribution and habitat association of the carnivores in Venezuela. Pp. 339-362, in: Advances on Neotropical Mammalogy (K Redford and JF Eisenberg, eds.), The Sandhill Crane Press, Inc., Florida.
- BOWDEN C. 1993. The Secret Forest. University of New Mexico Press, Albuquerque, New Mexico.
- BROWN DE. 1983. On the status of the jaguar in the southwest. Southwestern Naturalist 28:459-460.
- BROWN DE. 1985. Tigerillo—southwest mystery cat. Arizona Hunter, April: 28-29.
- BROWN DE. 1991. Revival of el Tigre? Defenders 66:27-35.
- BROWN DE. 1994. Biotic Communities: Southwest United States and Northwestern Mexico. University of Utah Press, Salt Lake City, Utah.
- BROWN DE. 1997. Return of el Tigre. Defenders 72:13-20.
- BROWN DE and CA LOPEZ GONZALEZ. 2000. Notes on the occurrences of jaguars (*Panthera onca*) in Arizona and New Mexico. Southwestern Naturalist 45:537-542.
- BROWN DE and CA LOPEZ GONZALEZ. 2001. Borderland Jaguars: Tigres de la Frontera. University of Utah Press, Salt Lake City, Utah.
- CEBALLOS G. 1997. Protecting biodiversity across the US-Mexico border. Center for Conservation Biology Update 10:8.
- CEBALLOS G, R LIST, J PACHECO, P MANZANO-FISCHER, G SANTOS, and M ROYO. 2005. Prairie dogs, cattle, and crops: Diversity and conservation in northern Mexico. In: Biodiversity, ecosystems, and conservation in northern Mexico (J Cartron, G Ceballos, and R Felger, eds.). Oxford University Press, Oxford.
- CRAWSHAW PG and HB QUIGLEY. 1991. Jaguar spacing, activity and habitat use in a seasonally flooded environment in Brazil. Journal of Zoology, London 223:357-370.
- DAVIS WB. 1974. The mammals of Texas. Texas Parks and Wildlife Bulletin No 41.
- EMMONS LH. 1987. Comparative feeding ecology of felids in a neotropical rainforest. Behavioral Ecology and Sociobiology 20:271-283.
- EMMONS LH, P SHERMAN, D BOLSTER, A GOLDIZEN, and J TERBORGH. 1989. Ocelot behavior in moonlight. Pp. 233-242, in: Advances on Neotropical Mammalogy (K Redford and JF Eisenberg, eds.). The Sandhill Crane Press, Inc., Florida.
- GEHLBACH FR. 1993. Mountains, islands and desert seas: A natural history of the US-Mexican borderlands. Texas A&M University Press, University Station, Texas.
- GIRMENDONK AL. 1994. Ocelot, jaguar and jaguarundi sighting reports: Arizona and Sonora, Mexico. Technical Report No. 35: Nongame and Endangered Wildlife Program. Arizona Game & Fish Department, Phoenix, Arizona.
- GLENN W. 1996. Eyes of fire: Encounter with a borderlands jaguar. Printing Corner Press, El Paso, Texas.
- GRIGIONE MM, A CASO, R LIST, and C LOPEZ GONZALEZ. 2001. Status and conservation of endangered cats along the US-Mexico border. The Endangered Species Update 18:129-132.
- HALL ER. 1981. The mammals of North America. John Wiley & Sons, New York.
- HOFFMEISTER DE. 1986. Mammals of Arizona. The University of Arizona Press and The Arizona Game and Fish, Tucson, Arizona.
- HOOGESTEIJN R and E MONDOLFI. 1993. The jaguar. Armitani Editores, Caracas, Venezuela.

- IUCN. 2007. Red List of Threatened Species. [www.iucnredlist.org](http://www.iucnredlist.org).
- KAPPELLE M and M JUAREZ. 1994. The Los Santos Forest Reserve: A buffer zone vital for the Costa Rican La Amistad Biosphere Reserve. *Environmental Conservation* 21:166-169.
- KITCHENER A. 1991. *The Natural History of the Wild Cats*. Cornell University Press, Ithaca, New York.
- KONECNY MJ. 1989. Movement patterns and food habits of four sympatric carnivore species in Belize, Central America. Pp. 243-264, *in: Advances on Neotropical Mammalogy* (K Redford and JF Eisenberg, eds.). The Sandhill Crane Press, Inc., Florida.
- KONSTANT W and R MITTERMEIER. 2002. Las Rocallosas del Norte. *In: Areas silvestres, las ultimas tierras virgenes del mundo* (R. Mittermeier, ed.). Cemex, Conservation Internacional y Agrupacion Sierra Madre, Mexico.
- LOPEZ-GONZALEZ CA. 2003. The ocelot *Leopardus pardalis* in north-western Mexico: ecology, distribution and conservation status. *Oryx* 37:358-364.
- MARRIS E. 2006. Wildlife caught in crossfire of US immigration battle. *Nature* 442:338-339.
- MARTINEZ A and R VALDEZ. 1998. Predator and prey surveys in northeastern Sonora, Mexico. Submitted to Charlie Sanchez Jr., Associate Regional Director for International Affairs, United States Fish & Wildlife Service, Albuquerque, New Mexico.
- MEDELLIN R, C MANTEROLA, M VALDEZ, D HEWITT, D DOAN-CRIDER, and T FULBRIGHT. 2005. History, ecology and conservation of pronghorn antelope, big horn sheep and black bear in Mexico. *In: Biodiversity, ecosystems, and conservation in northern Mexico* (J. Cartron, G Ceballos, and R Felger, eds.). Oxford University Press: Oxford.
- NOWELL K and P JACKSON. 1996. Wild cats: status survey and conservation action plan. Cat Specialist Group, World Conservation Union/Species Survival Commission, Gland, Switzerland.
- PRUSS M. 1999. Summary of selected Neo-tropical cat sightings in SE Arizona since 1993. Arizona Game & Fish Department, Phoenix, Arizona.
- RABINOWITZ A. 1995. Jaguar conflict and conservation: a strategy for the future. Pp. 394-397, *in: Integrating people and wildlife for a sustainable future* (JA Bissonette and PR Krausman, eds.). The Wildlife Society, Bethesda, Maryland.
- RUSSELL S and G MONSON. 1998. *The birds of Sonora*. The University of Arizona Press, Tucson, Arizona.
- SUNQUIST M, EF SUNQUIST, and DEDANEKE. 1989. Ecological separation in a Venezuelan llanos carnivore community. Pp. 197-232. *in: Advances in Neotropical Mammalogy* (K Redford and JF Eisenberg, eds.). The Sandhill Crane Press, Inc., Florida.
- TERBORGH J, L LOPEZ, P NUNEZ, M RAO, G SHAHABUDIN, G ORIHUELA, M RIVEROS, R ASCANO, G ADLER, T LAMBERT, and L BALBAS. 2002. Ecological meltdown in predator-free forest fragments. *Science* 292:1923.
- UNITED STATES FISH AND WILDLIFE SERVICE (USFWS). 1990. Listed cats of Texas and Arizona: Recovery plan. Albuquerque, New Mexico.
- WERDELIN L. 1985. Small Pleistocene felines of North America. *Journal of Vertebrate Paleontology* 5:194-210.
- YOUNG A and G Clarke. 2000. Genetics, demography and viability of fragmented populations. Cambridge University Press: Cambridge.