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Abstract: This document embraces two components. First, a Conservation Assessment describes the current status of the jaguar in the United States, and identifies and assesses risks to the jaguar in Arizona and New Mexico. The Assessment focuses the second component, the Conservation Strategy, on reducing or eliminating these threats in Arizona and New Mexico, which might allow for expansion of the range currently occupied by the Arizona subspecies, and thus contribute to promoting recovery of the species.

CONSERVATION ASSESSMENT AND STRATEGY  
FOR THE  
JAGUAR IN ARIZONA AND NEW MEXICO

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CONSERVATION ASSESSMENT AND STRATEGY  
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JAGUAR IN ARIZONA AND NEW MEXICO

Terry B. Johnson and William E. Van Pelt

INTRODUCTION

In 1994, the U.S. Fish and Wildlife Service (Service, or USFWS) published a proposed rule to list the jaguar (*Panthera onca*) as endangered pursuant to the Endangered Species Act (Act, or ESA) of 1973, as amended (USFWS 1994a). The jaguar had previously been listed as endangered only from the U.S.-Mexico border south through Central and South America (c.f. USFWS 1972, 1975, 1994b). In 1979, the Service had announced that its failure to list the jaguar as endangered north of the U.S.-Mexico border was an oversight that would be rectified "as quickly as possible" (USFWS 1979). Prior to the 1994 proposal, efforts to rectify the oversight failed, due to workload considerations and higher priorities.

The Service's 1994 listing proposal described various threats to the jaguar. The purpose of this Conservation Assessment and Strategy is to address those threats by providing for conservation of the subspecies of jaguar occurring in Arizona and New Mexico, consistent with the intent of the Act. The program described herein will be accomplished through actions to gather relevant information essential to management and conservation, reduce specific threats, provide long-term commitments to identify and eventually coordinate protection of jaguar habitat, and carry-out any other appropriate conservation actions. Thus, this document and its companion *Memorandum of Agreement for Conservation of the Jaguar in Arizona and New Mexico* (JAGMOA) will allow the Service to consider how the identified threats will be reduced by implementing these actions, as the Service considers the proposed rule to list the jaguar.

This document embraces two components. First, a Conservation Assessment describes the current status of the jaguar in the United States, and identifies and assesses risks to the jaguar in Arizona and New Mexico. The Assessment focuses the second component, the Conservation Strategy, on reducing or eliminating these threats in Arizona and New Mexico, which might allow for expansion of the range currently occupied by the Arizona subspecies, and thus contribute to promoting recovery of the species.

Information in this document comes primarily from the state level, an approach that considers regional variation and provides a complete habitat and species assessment. It was compiled primarily by the Arizona Game and Fish Department (AGFD) and the New Mexico Department of Game and Fish (NMDGF), with considerable assistance from the U.S. Fish and Wildlife Service (USFWS) and other cooperators.

## CONSERVATION ASSESSMENT

The following subsections provide life history, status, and management information on the jaguar.

### DESCRIPTION

The jaguar is a member of the cat family (Felidae; Order Carnivora). It is allied with the "roaring" cats (African lion, tiger, leopards), and is the largest cat native to the Western Hemisphere (Nowak 1991). Adult males average 200 pounds in weight, and may exceed 300 pounds. Adult females average 150 pounds. Juveniles weigh 80 to 100 or more pounds. Jaguars are muscular, with relatively short, massive limbs and a deep-chested body. Adult lengths range from about six to eight feet (body and tail). Jaguars are cinnamon-buff in color, with many black spots. A black or melanistic color phase occurs primarily in the southern parts of the range.

### LIFE HISTORY

The life history of the jaguar has been summarized by Nowak (1991) and Seymour (1989), among others. Jaguars breed year-round range-wide, but at the southern and northern ends of the range there is evidence of a spring breeding season. Gestation is about 100 days; litters range from one to four cubs (usually two). Cubs remain with their mother for nearly two years. Females begin sexual activity at three years of age, males at four. Studies have documented few wild jaguars more than 11 years old.

The list of prey taken by jaguars range-wide includes more than 85 species (Seymour 1989; see also Rabinowitz and Nottingham 1986). Prey include peccaries (javelina), capybaras, pacas, armadillos, caimans, turtles, and various birds and fish. Javelina and deer are presumably dietary mainstays in the U.S.-Mexico borderlands, as they are in Jalisco (western Mexico; B. Miller pers. comm.), the nearest area in which jaguars have been (and are still being) studied. Dietary overlap of jaguars and mountain lions in Jalisco is about 70 percent (B. Miller pers. comm.), with jaguars tending to slightly larger prey.

Jaguars are known from a variety of habitats (Nowak 1991, Seymour 1989), including the arid American Southwest (Nowak 1994). Toward and at middle latitudes, they show a high affinity for lowland wet habitats, typically swampy savannas or tropical rain forests. However, they also occur in upland habitats in warmer regions of North and South America. Swank and Teer (1989) stated that jaguars prefer a warm, tropical climate, usually associated with water, and are only rarely found in extensive arid areas. However, jaguars occur in dry tropical forest in Jalisco (B. Miller pers. comm.), and as recently as 1991 local residents told D.E. Brown and T.B. Johnson (pers. obs.) that jaguars were not unusual, and in fact were still hunted, in the arid Sierra del Bacatete (Sonora, Mexico).

Quigley and Crawshaw (1992) estimated that a minimum of 772 to 1160 mi<sup>2</sup> is needed to support 30

to 50 adult jaguars; the actual area depends upon prey density, habitat composition, and the amount of human exploitation. Individual jaguar home ranges vary from 11 to 16 mi<sup>2</sup> in Belize (Rabinowitz and Nottingham 1986) and from 10 to 20 mi<sup>2</sup> in Jalisco, Mexico (B. Miller pers. comm.). In Jalisco, home ranges tend to be smaller in the dry season than in the wet season, and females with young kittens tend to have smaller home ranges than those with older kittens (B. Miller pers. comm.). However, B. Miller (pers. comm.) has noted that individuals recorded at the same location on consecutive days have actually traveled as much as nine miles overnight before returning to that location.

#### TAXONOMY

Five subspecies of jaguar were recognized by Hall (1981) and eight by Seymour (1989),<sup>1</sup> including two with historic ranges extending into the United States (the Arizona jaguar, *Panthera onca arizonensis*; and the northeastern jaguar, *P.o. veraecrucis*). Records from Arizona and New Mexico (and California) are attributed to *arizonensis*, the type specimen of which was collected by Jack Funk in 1924, near Cibeque, Navajo County, Arizona (Goldman 1932). Nelson and Goldman (1933) described the distribution of *arizonensis* as the mountainous parts of eastern Arizona north to the Grand Canyon, southwestern New Mexico, northeastern Sonora, and formerly (perhaps; see below) southeastern California. Jaguar records for Texas (and perhaps Louisiana) have been attributed to *veraecrucis*. Nelson and Goldman (1933) described the distribution of *veraecrucis* as the Gulf slope of eastern and southeastern Mexico from the coast region of Tabasco north through Vera Cruz and Tamaulipas to central Texas.

#### DISTRIBUTION

Swank and Teer (1989) indicated the jaguar's historic distribution included portions of Arizona, New Mexico, and Texas. However, they considered the presently-occupied range to extend from central Mexico through Central America into South America, as far south as northern Argentina.

Bailey (1905) stated the jaguar was once reported as common in southern and eastern Texas but by the turn of the century had already become extremely rare. Nowak (1975) believed an established population once occurred in dense thickets along the lower Nueces River and northeast to the Guadalupe River. He suggested jaguars probably continued to wander from Mexico into the brush country of the southernmost part of Texas. However, the most recent Texas jaguar record is from Kleburg County in 1948 (Nowak 1975). Habitat fragmentation and loss above and below the U.S.-Mexico border now make reoccurrence in Texas unlikely.

The jaguar may have occurred historically in Louisiana (Baird 1859; Lowery 1974; Nowak 1973,

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<sup>1</sup>*Panthera* is used herein as the genus for the jaguar, per Nowak (1991) and others. Various earlier publications, including some of those referenced herein refer it to the genus *Felis*.

1975), but habitat fragmentation and loss now make reoccurrence unlikely.

The jaguar also may have occurred historically in California. This seems logical, considering the historical condition of the lower Colorado River and its tributaries from southeastern Arizona and eastern New Mexico (e.g. Santa Cruz, San Pedro, and Gila Rivers. In 1827, the James Ohio Pattie expedition killed a jaguar on the Colorado River below the mouth of the Gila River, near Yuma (see Brown 1983 and Davis 1982). Merriam (1919), Nowak (1975), and Strong (1926) mentioned reported jaguar occurrences in California, but without sufficient evidence to warrant acceptance by the California Department of Fish and Game (R. Jurek pers. comm.). Regardless, as with Texas and Louisiana, habitat fragmentation and loss now make reoccurrence in California unlikely.

Although female jaguars have been reported from the United States, evidence of breeding in Arizona-New Mexico is limited to: a reported kill of a female with two kittens, near the Grand Canyon between 1885 and 1890 (Arizona; see Lange 1960); a reported kill of a female and her young at the head of Chevelon Creek in 1910 (see Brown 1987 and Nowak 1975); and a newspaper report of a female killed and her two kittens captured in the Chiricahua Mountains in 1906 (see Brown 1987). Recent sightings in Arizona and New Mexico appear to be mostly, if not entirely, of transient young males from Mexico.

The historic and current distribution of jaguars for Arizona and New Mexico is as follows:

Arizona. Davis (1982) published reports by several explorers in the 1800s of jaguars killed in southeastern Arizona or adjacent Sonora, Mexico. Among them was an 1855 notation by Dr. C.B.R. Kennerly in Emory's (1857) Boundary Survey that natives considered *el tigre* (the jaguar) common in the Santa Cruz River valley [which is south of Nogales, Arizona and Sonora]. Goldman (1932) believed the jaguar historically was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered it an uncommon resident south of the Mogollon Rim, concluding that reports between 1885 and 1965 indicated a small but resident population existed in Arizona. Brown (1983) suggested jaguars were resident historically in Arizona and ranged widely throughout a variety of habitats from Sonoran desertscrub upward through subalpine conifer forest. Most historic records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along major rivers.

Jaguars persisted in central Arizona as late as the 1960s, when three were taken on the Fort Apache and San Carlos Indian Reservations. Individuals were occasionally reported from southeastern Arizona into the 1970s and 1990s, individuals were unlawfully killed there in 1971 and 1986, and two uncaptured animals were documented by photographs in 1996 (Baboquivari Mountains, Pima County; Peloncillo Mountains, Cochise County).

The total number of jaguar records (known specimens, killings reported, and credible sight records) for Arizona since 1848 is at least 84 (AGFD unpubl. records; see also Brown 1983



and Lange 1960).

New Mexico. Barber (1902) speculated that jaguars made their way into the Mogollon Mountains of New Mexico by ascending the Gila River, presumably from Arizona. Bailey (1931) suggested they seemed to be native to southern New Mexico, but should be regarded as wanderers from Mexico. Bailey listed nine reports from New Mexico from 1855 to 1905. Brown (1983) stated the last record from New Mexico was from 1905. Nowak (1975) mentioned jaguars were reported along the Rio Grande as late as 1922. Halloran (1946) reported that dogs "jumped" a jaguar in the San Andres Mountains in 1937. Findley et al. (1975) stated that jaguars once occurred as far north as northern New Mexico. A jaguar first seen in Arizona in March 1996 was tracked into extreme southwestern New Mexico (Peloncillo Mountains) shortly thereafter.

#### MANAGEMENT STATUS

The jaguar is federally listed by the United States of America, pursuant to ESA, as endangered within its historic range south of the United States (USFWS 1975). It is also proposed as endangered within its former range in the United States (USFWS 1994a) and is listed under the Convention on International Trade in Endangered Species (CITES) as an Appendix 1 species. CITES prohibits international trade among member nations in Appendix 1 species, including trophies, skins, and products.

The jaguar is also listed by Mexico as an endangered species. It was first listed there on May 17, 1991, as threatened (SEDUE 1991). It was uplisted to endangered on May 16, 1994 (SDS 1994). No explanation was published with the uplisting, nor is any available from officials in Mexico (F. Abarca pers. comm.). Under Mexican law, endangered and threatened species (or any parts thereof) can only be taken for scientific or recovery (captive propagation) purposes, and then only with prior authorization from the Secretariat of Environment, Natural Resources, and Fisheries (SEMARNAP by its Spanish acronym). In Mexico, specimens and parts of endangered species cannot be used for commercial purposes.

Until recently, the states of Arizona and New Mexico had considered the jaguar to be extirpated from within their borders as a resident species. In Arizona (AGFD 1988), recent records were attributed to transient individuals from Mexico. As mentioned earlier, more recent records now indicate the species is at least occasionally present in both states. Whether the animals occurring there are resident or transient is unknown. Regardless, both states give the jaguar endangered (NMDGF 1996) or "species of special concern" (AGFD 1988, in prep.) status under state law or policy guidelines. Current state regulations are as follows:

Arizona. Jaguars are listed as a nongame mammal under Commission Order 14, with no open season for legal take by hunting. Violation of this order is considered a Class 2 misdemeanor. The State of Arizona, through criminal prosecution, may seek to recover a

maximum of \$750 and/or four months imprisonment for each animal unlawfully taken, wounded, or killed. The Arizona Game and Fish Commission may also assess civil damages of an unspecified amount, for unlawful take.

Arizona Revised Statute 17.239, Subsection A, declares that "Any person suffering property damage from wildlife may exercise all reasonable measures to alleviate such damage, except that reasonable measures shall not include injuring or killing game mammals, game birds or wildlife protected by federal law or regulation." Because the jaguar is not classified by Arizona as a game mammal, and is not federally listed for the United States as endangered or threatened, this statute provides legal grounds for take of a depredating animal. However, livestock depredation by a jaguar has not been an issue in Arizona since at least 1965, and none of the jaguars occurring in the state since then has been taken as a depredating animal. An attempt was made to claim such take in conjunction with the 1986 Dos Cabezas jaguar, but the court did not recognize it and criminal penalties were assessed.

The jaguar is being considered for inclusion on the Department's list of *Wildlife of Special Concern in Arizona* (AGFD in prep.), and was included on the Department's previous list of *Threatened Native Wildlife in Arizona* (AGFD 1988).

New Mexico. On July 25, 1991 the jaguar was added to the list of endangered species and subspecies of New Mexico, as a restricted species (see NMDGF 1996) . According to New Mexico law, it is unlawful for any person to take, possess, transport, export, process, sell, or offer for sale a jaguar in New Mexico. Violation of provisions of Subsection C of Section 17-2-41 NMSA 1978, or regulations pursuant to that section, is a misdemeanor, and upon conviction, a person shall be fined \$1000 or imprisoned for a term of not less than 30 days nor more than one year, or both.

#### RISK ASSESSMENT

The Service assessed real and/or potential problems that face the jaguar, based on one or more of five "factors," as required by Section 4(a)(1) of the Act. The Service stated that four of the five listing factors were being compromised, and were thus threatening jaguars. A fifth factor, disease or predation, was not considered applicable. The four applicable factors, and the relevant findings of the signatories to the JAGMOA, are as follows:

Present or threatened destruction, modification, or curtailment of its habitat or range. Throughout the jaguar's suspected historic range within the United States, clearing of habitat, destruction of riparian areas, and fragmentation or blocking of movement corridors has probably contributed to preventing jaguars from recolonizing previously inhabited areas. Although a resident population of jaguars is not currently known to occur in the United States, individuals from Mexico have crossed and are still crossing into Arizona and New Mexico for varying periods of time. The most recent records are from 1996, for Arizona

(Baboquivari Mountains) and Arizona-New Mexico (Peloncillo Mountains). The Peloncillo jaguar was first seen in March 1996 (Glenn 1996). Its tracks were first seen a year earlier (W. Glenn pers. comm.; B. Starrett pers. comm.) and as recently as December 1996 (W. Glenn pers. comm.).

Little is actually known about the habitats historically used by jaguars in the Southwest. Inferences from documented specimens and other records suggest that riparian habitats (especially broad river valleys and floodplains) were important as movement corridors and perhaps as foraging and denning habitat (river floodplains and tributary canyons). Many such habitats have been radically altered, and in some cases destroyed, over the past century. Efforts to restore them are underway in the United States, but could be enhanced through stronger private-public partnerships and progressive management. The importance of other habitats (e.g. desertscrub, grasslands, evergreen woodlands, and conifer forests) is unknown, except that likely prey populations (e.g. deer and javelina) are widely present in them. Notably, however, two of the three most recent jaguar records from Arizona were in north-south oriented mountain ranges (Peloncillos, Baboquivaris) that extend into Mexico, which should facilitate cross-border movement.

**Finding:** Actual habitat requirements of jaguars in the U.S.-Mexico borderlands are largely speculative, and based on anecdotal information and inference. Thus, at this point, habitat conservation actions should be focused on gathering information on actual use-patterns of jaguars occurring in and near the U.S.-Mexico borderlands in Arizona and New Mexico. Existing land-protection efforts and federal/state land-management programs could then be focused on habitats actually important to the jaguar. Existing state and federal laws and policies are adequate to provide for such actions, especially in regard to lands under management jurisdiction of the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and U.S. Forest Service. On private lands, the potential for habitat conservation measures is limited by the extent to which the landowners wish to cooperate in such programs. Before such proposals are made, better information is needed on what is and is not suitable jaguar habitat, and the extent to which dispersal or recolonization is likely. Acquisition or "set-aside" protection mechanisms such as wilderness designation or broad area closures may not be necessary to meet the jaguar's habitat needs.

Overutilization for commercial, recreational, scientific, or educational purposes. Although the demand for jaguar pelts has diminished since the 1960s, it still exists, as does illegal hunting of jaguars. In 1992, Arizona Game and Fish Department personnel infiltrated a ring of wildlife profiteers. That operation resulted in the March 1993 seizure of two jaguar specimens, one of which was taken in Arizona's Dos Cabezas Mountains in 1986. The specimens had been covertly purchased from the suspects. During the investigation, several ties were discovered to jaguar hunting in Mexico. Hounds bred and trained in the United States were being sold to Mexican nationals for the purpose of hunting jaguars. Mexican

nationals prosecuted by the U.S. Fish and Wildlife Service in 1989 for illegally importing jaguar pelts into the United States were continuing to provide jaguar hunts in Mexico. Unlawful jaguar hunting still occurs in Mexico, including in a Jalisco jaguar preserve (B. Miller pers. comm.). Estimated values of jaguar hunts and pelts are as follows (fide J. Phelps, AGFD): cost of legal hunt in Venezuela, \$10,000 to \$15,000; cost of illegal hunt in Mexico, \$10,000 to \$15,000; value of legally taken pelt \$10,000; value of illegally taken pelt, \$5,000 to \$8,000.

**Finding:** Hunting and unlawful take of jaguars still occurs in Mexico, but no relevant specific data are known at this time. The species is already federally listed as endangered for that portion of its range by the United States and Mexico. Listing the species north of the U.S.-Mexico border would not convey greater protection for animals south of the International Border. The two known incidents of unlawful take in the United States over the past 30 years were both in Arizona (1971, Nogales area; 1986, Dos Cabezas Mountains). The first involved two juvenile duck hunters who, on approaching a water hole, surprised and shot a young jaguar (Brown 1987). The hunters claimed not to know the season was closed for the species. They were found guilty, and the jaguar skull was deposited at the University of Arizona, but were allowed to keep the hide. In the second case, a houndsman killed a jaguar at night after following it with his hounds. He first thought it was a mountain lion, then recognized it as a jaguar and killed it anyway. Several years later, at the conclusion of a covert investigation of other activities, he was charged with violation of such a number of state and federal wildlife laws (including unlawful take of a jaguar) as to suggest little concern for the legality of his actions. Had the jaguar been federally listed for Arizona, the penalties invoked might well have been greater in both cases, but whether they would have been a deterrent to the killing of the Dos Cabezas animal is arguable. Even so, state civil damages and/or criminal penalties could be made comparable to civil and federal penalties under the Act, thus providing comparable deterrent values. Enhanced educational efforts are also needed to address unlawful take. The Service could also invoke the "similarity of appearance" clause of Section 4(e) of ESA to protect the jaguar, thus enabling assessment of the full civil and criminal penalties under Section 9 of ESA for acts of unlawful take. Meanwhile, the Lacey Act of 1990 (as amended; 16 U.S.C. 701) provides a means of addressing unlawful traffic in jaguar specimens or parts thereof, and CITES also provides a means of legal recourse in cases of unlawful trade involving signatory nations such as Mexico. Regardless, further reduction or outright elimination of the population in northern Mexico is the principal risk to continued presence of the jaguar in the United States.

Inadequacy of existing regulatory mechanisms. Arizona and New Mexico both provide protection to the jaguar under state laws, but unlawful take has still occurred (e.g. Arizona: 1971 and 1986). The Service infers that the greater federal penalties incurred under

protection of ESA for unlawful take would be a more substantial deterrent, and in some cases could operate in concert with the Lacey Act, CITES, and applicable state laws. Under ESA, unlawful take could result in civil penalties of as much as \$25,000 per violation (see ESA, Section 11(a)1) and criminal penalties of up to \$50,000 and one year in prison for each violation (see ESA, Section 11(b)1).

**Finding:** Although two jaguars were killed unlawfully in the United States during the past 30 years (Arizona: 1971 and 1986), it is doubtful that protection under ESA would have prevented such take. In the first incident, two juvenile duck hunters, on approaching a water hole, surprised and shot a young jaguar (Brown 1987). The hunters claimed not to know the season was closed for the species. They were found guilty, and the jaguar skull was deposited at the University of Arizona, but were allowed to keep the hide. In the second case, a houndsman killed a jaguar at night after following it with his hounds. He first thought it was a mountain lion, then recognized it as a jaguar and killed it anyway. Several years later, at the conclusion of a covert investigation of other activities, he was charged with violation of such a number of state and federal wildlife laws (including unlawful take of a jaguar) as to suggest little concern for the legality of his actions. Had the jaguar been federally listed for Arizona, the penalties invoked might well have been greater in both cases, but whether they would have been a deterrent to the killing of the Dos Cabezas animal is arguable. Even so, state civil damages and/or criminal penalties could be made comparable to civil and federal penalties under the Act, thus providing comparable deterrent values. Enhanced educational efforts are also needed to address unlawful take. The Service could also invoke the "similarity of appearance" clause of Section 4(e) of ESA to protect the jaguar, thus enabling assessment of the full civil and criminal penalties under Section 9 of ESA for acts of unlawful take. Regardless, further reduction or outright elimination of the population in northern Mexico is the principal risk to continued presence of the jaguar in the United States.

Other natural or manmade factors affecting its continued existence. USDA Animal Plant and Health Inspection Service-Animal Damage Control (APHIS-ADC) personnel use traps, snares, and M-44 ejector devices with cyanide capsules to resolve coyote depredations in Cochise and Hidalgo counties. Mountain lion problems are resolved through use of trained dogs, and in Hidalgo County also by use of foot snares. Any of these methods could result in take of a jaguar.

**Finding:** ADC personnel have not taken a jaguar during the past 30 years of use of the above-mentioned devices and methods, and the potential for doing so is exceedingly low. To further reduce threat to jaguars when using these devices and methods, APHIS-ADC abides by all state and federal laws, internal policies, and mitigation measures listed in environmental documents. In Arizona, the threat to jaguars was further reduced in 1994 by passage of Proposition 201, as incorporated

into A.R.S. 17.301.D, which prohibits use of traps, snares, and poisons on public lands in Arizona. Formal consultations between the Service and APHIS-ADC regarding ongoing predator control actions within the jaguar's historic range have not been concluded as this document is being written. In those consultations, APHIS-ADC has considered potential impacts to two other endangered cats resident in South Texas, the jaguarundi (*Felis yagouaroundi*) and ocelot (*F. pardalis*). It could extend the same or other special considerations to the jaguar, perhaps restricting or providing explicit guidelines for use of M-44s and traps or snares in Cochise, Pima, and Santa Cruz counties in Arizona, and Hidalgo County in New Mexico.

## CONCLUSION

Historically, jaguars occurred widely but sparsely in the American Southwest and adjacent Mexico. In Arizona and New Mexico, the number of records indicates the jaguar was probably resident, but evidence of breeding is scant. The more recent records (post 1960) are largely, if not entirely, of young males, suggesting dispersal from a core population persisting in Sonora, Mexico. Through the 1960s, most jaguars that were seen in Arizona-New Mexico were killed. Two jaguars occurring in the United States in the 1970s and 1980s were also killed.

For the jaguar to persist in Arizona-New Mexico, it must be protected from killing, its habitat needs must be met, and a core population in adjacent Mexico must be sufficient to provide for dispersal to the United States. In terms of vegetation, jaguar habitat in Arizona-New Mexico appears to range from riparian-lined river valleys to desert grassland, desertscrub, Madrean oak woodland, and higher elevation conifer forest. Abundance of available prey, and suitable resting sites, may be more important than a particular vegetation type.

The mosaic of habitats in which jaguars have occurred in Arizona-New Mexico is mirrored by a complex pattern of land ownership. A patchwork mosaic of federal, state, tribal, and private lands overlays the habitat mosaic. A conservation program for the jaguar must consider both mosaics, and provide opportunities and incentives for involvement by all the interested and affected parties. It must include the approaches noted by Weber and Rabinowitz (1996) as hallmarks of successful conservation projects: field research (to provide a sound scientific basis for decisions); consideration of relevant cultural, economic, and political factors; design and implement a comprehensive approach to conservation (including public education); and monitoring and feedback.

## CONSERVATION STRATEGY

### INTRODUCTION

This conservation strategy describes the goal, objectives, strategies, and activities that will be implemented to conserve jaguars in Arizona and New Mexico. It reflects the metapopulation concept<sup>2</sup> for species persistence and an ecosystem management<sup>3</sup> approach for habitat conservation. Planning and management proposals and actions will be coordinated among the two states, the Service, other government cooperators, and private entities.

The primary feature of this Strategy is an interstate/intergovernmental Jaguar Conservation Team (JAGCT). JAGCT members may be assigned to various technical committees as information or other needs (e.g. review of materials) arise. Each state wildlife agency JAGCT member is responsible for coordinating the conservation strategy activities within its respective state. Any member of the public may assist by attending JAGCT meetings, providing comment on documents and proposed actions, and by voluntary participation in the Arizona-New Mexico Jaguar Working Group (JAGWG), when it is established by the JAGCT.

This Strategy will be further developed and implemented through cooperation of federal, state, tribal, and other government cooperators, and through partnerships with private landowners and organizations. Species restoration and habitat conservation is linked to key federal, state, and private land ownership patterns. This Strategy identifies both short and long-term objectives, and sets various time frames to complete activities. The state wildlife agencies will reallocate funds and personnel as necessary to implement this Strategy, and will aggressively seek new funds to facilitate implementation.

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<sup>2</sup>A metapopulation of wildlife is one in which animals dispersing from a larger, persistent, core population are essential to maintaining relatively transient peripheral subpopulations, or occasional occurrences. In this situation, a healthy core population of jaguars in northwestern Mexico is believed essential to providing dispersing individuals that range into Arizona and New Mexico for as-yet unknown periods of time.

<sup>3</sup>For purposes of this document, ecosystem management means coordinated management of habitats and species within a given broad area to maintain, or restore where appropriate, biological diversity. Effective management of one species, the jaguar, cannot be achieved without considering the full spectrum of wildlife, habitats, land uses, and human factors that operate within its area of occurrence. The very presence of jaguars may indicate an increasingly hospitable landscape in Arizona-New Mexico, and/or landscape changes in Mexico that are causing jaguar populations there to increase and disperse, or to decrease through emigration.

Effective conservation of the jaguar and its habitat under this Strategy will necessarily depend on cooperation of federal, state, and private landowners. Thus, all cooperators must, from the beginning, be aware of the importance of full involvement of private landowners to the extent they wish to be involved, and further recognize the importance of compatible rural livelihoods and activities, such as ranching and outdoor recreation (including hunting and wildlife watching), and voluntary participation by private landowners in habitat identification, enhancement, and protection, as key to the conservation strategy.

#### GOAL

The goal of this Strategy is to conserve naturally occurring jaguars in Arizona and New Mexico, and to encourage parallel conservation actions in Mexico, by (a) gathering and disseminating information on status, biology (including habitat use), and management needs; (b) identifying habitat suitable for population maintenance or expansion in Arizona and New Mexico; (c) allowing for innovative and adaptive management; (d) creating strong private-public partnerships; and (e) developing stronger legal disincentives for unlawful take.<sup>4</sup>

The actions under this Strategy will: (a) promote conservation of the jaguar and its habitat; (b) reduce risk of overutilization of the jaguar for commercial, recreational, scientific, or educational purposes; (c) focus appropriate use of existing regulatory mechanisms and provide for increased deterrents to unlawful take of the jaguar; and (d) reduce risk of any other factors affecting continued existence of the jaguar in Arizona and New Mexico.

#### OBJECTIVES, STRATEGIES, AND ACTIVITIES

1. Implementation of the Conservation Strategy.
  - A. This Strategy will be implemented through a Memorandum of Agreement for Conservation of the Jaguar in Arizona and New Mexico (JAGMOA), which will be signed by state and federal cooperators and local and tribal governments with land or wildlife management responsibilities in the area of concern (principally Hidalgo County, New Mexico; and Cochise, southern Pima, and Santa Cruz counties, Arizona) that wish to voluntarily cooperate in conserving the jaguar.

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<sup>4</sup>For purposes of this document: "unlawful take" shall mean to kill or capture a jaguar without legal authority to do so; "incidental take" shall mean lawful capture that accidentally but not negligently results in death or infliction of debilitating injury that precludes release of the animal; and "take" shall neither be construed nor interpreted as including modification of habitat, inadvertent pursuit of the jaguar, or recreational activities or wildlife or land management actions as may indirectly affect the jaguar.



- B. It is fundamental that the needs of the jaguar must be met in the context of a wide spectrum of other wildlife needs and a variety of land uses on federal, state, and private lands. Thus, it follows that this Strategy must be implemented in complete recognition of those factors, and through close coordination with other current or future planning and management efforts, including federal, state, and private cooperative efforts in ecosystem management, wildlife management, allotment management, etc. Any proposed changes to Allotment Management Plans or other land use will be done in careful and considered consultation, cooperation, and coordination with the lessees, permittees, other involved landowners, and any state or states having lands within the area covered by the proposal, per Section 8 of the Public Rangelands Improvement Act (PRIA) (Public Law 95-514/714/1978, U.S.C. Title 43 §1901).
  - C. Although this Strategy applies to the full historical range of the jaguar in Arizona and New Mexico, it will initially be focused in Cochise, southern Pima, and Santa Cruz counties in Arizona, and Hidalgo County in New Mexico, as those are the primary areas in which jaguars have been confirmed or reported in the past few decades. This restricted geographic approach will allow available resources to be focused in the area in which a substantive return is most likely.
  - D. Participation in developing and implementing this Strategy is strictly voluntary.
2. Establishment of a Jaguar Conservation Team (JAGCT) and an Arizona-New Mexico Working Group (JAGWG).
- A. The JAGCT will be comprised of one representative from each signatory to the JAGMOA. This is necessary to ensure that members have the authority to carry out the actions to which they voluntarily agree.
    - (1) The two state wildlife agencies and the Service will be known as the joint leads or primary cooperators in developing and implementing this Strategy.
    - (2) Other JAGMOA signatories will be known as cooperators in developing and implementing this Strategy. They will be comprised of state and federal agencies and programs, and local and tribal governments. At a minimum, the cooperators will include the Bureau of Land Management (Arizona and New Mexico), National Park Service, U.S. Forest Service, USDA APHIS-ADC (Arizona and New Mexico), the Arizona and New Mexico State Land Departments, the Arizona and New Mexico Departments of Agriculture, and the counties of Cochise, Pima, and Santa Cruz (Arizona) and Hidalgo and Otero (New Mexico). The Border Patrol and Immigration and Naturalization Service are also desired as cooperators, in regard to their land use activities

- along the Arizona-New Mexico/Mexico Border that may affect jaguars or jaguar habitat.
- (3) Interested private citizens and organizations will be encouraged to cooperate with the JAGCT by attending its meetings and by participating in voluntary, action-specific agreements to promote jaguar conservation and education activities.
  - (4) The JAGCT will be formed as a functional entity on execution of the JAGMOA. It will coordinate and assist in directing the activities outlined in this Strategy. It will also review information provided by interested and affected parties, outline management guidelines, research, and education needs, and identify known and potential funding sources for carrying out this work.
  - (5) The JAGCT will meet quarterly, in January, April, July, and October, for the first 12 months of its existence. Thereafter, it will meet at least once annually, and more often as deemed appropriate by the cooperators. JAGCT meetings will be open to the public, with agendas available to the public at least 30 calendar-days in advance, via notice sent to the JAGCT/JAGWG mailing list maintained by the primary cooperators.
  - (6) JAGCT meetings will be held in Douglas (Arizona) and Lordsburg (New Mexico) on a rotational basis. In the event that jaguars are found to occur in other areas of Arizona-New Mexico, locations for JAGCT meetings will be re-set to ensure that each general area of occurrence has an equitable share of the JAGCT meetings.
  - (7) The JAGCT will initially be chaired by the AGFD or the NMDGF representative, as chosen by the cooperators. This will ensure appropriate administrative support for JAGCT meetings. The chair's term of office will be one year, without limit on the number of terms served. Subsequent chairs will be JAGCT members selected by the primary and other cooperators.
- B. The JAGCT will establish a JAGWG, to provide for direct public involvement in addressing specific jaguar conservation issues and reporting recommendations back to the JAGCT.
- (1) Participation in JAGWG is strictly voluntary.
  - (2) JAGWG participation may be at the individual or the organizational level. Organizations and individuals that have indicated they wish to participate include: Arizona and New Mexico Cattle Growers' Associations, Bootheel

Heritage Association, Cochise-Graham Cattle Growers Association, Defenders of Wildlife, Eastern Arizona Counties Organization, Hidalgo County Cattle Growers, Malpai Borderlands Group, New Mexico Department of Agriculture, New Mexico Farm and Livestock Bureau, Phelps Dodge Mining Corporation, Safari Club International, Sky Island Alliance, The Phoenix Zoo, The Wildlands Project, and the Wildlife Conservation Advisory Council.

- (3) JAGWG participants will be informed of all JAGCT meetings at least 30 calendar-days in advance by notice sent to the JAGCT/JAGWG mailing list maintained by the primary cooperators.

3. Species distribution and status.

- A. AGFD and NMGFD will collect and compile jaguar distribution and occurrence information, and other information relevant to conservation of the species, from the United States, Mexico, and elsewhere as appropriate. They will collect these data through mechanisms such as systematic surveys, a system for reporting and verification of sightings (see C below), and field investigations. Published and other currently available information will be compiled by the second JAGCT meeting. The compiled occurrence information will be submitted to at least three experts in the field for evaluation as to accuracy and importance. Collection of additional occurrence information will be ongoing.
- B. If a jaguar is found residing in or consistently inhabiting areas within Arizona and/or New Mexico, or along the International Border, the state wildlife agencies will make a concerted effort to monitor its movements through the least intrusive, but most effective, means possible. Further, any jaguar captured in a state-permitted trap shall be reported to the appropriate state wildlife agency before release, so a decision can be made as to whether to radio-collar and monitor it.
  - (1) Within 60 calendar-days of execution of the JAGMOA, the JAGCT will establish procedures for handling jaguars that are captured live.
- C. The JAGCT will, within 90 calendar-days of execution of the JAGMOA, establish and then coordinate and maintain a jaguar sighting report procedure and database that will enable project cooperators and the public to assist in providing information about occurrence of the species. The system will include detailed criteria by which to assign a credibility ranking, so that confirmed records are the primary basis for JAGCT recommendations and actions. The criteria will address such factors as type and quality of sighting (e.g. distinct tracks, clear and well focused photograph, detailed sight record), the observer's experience with jaguars and similar species, weather conditions at time of sighting, total time in which the animal was under

observation, etc.

- D. The JAGCT will, within 12 months of execution of the JAGMOA, compile a draft report on the status of the jaguar in Arizona-New Mexico, on the basis of the scientific literature and all relevant information gathered pursuant to this Strategy. The draft report will be submitted to at least three experts in the field for review, and to the general public for comment.
4. Cooperation with Mexico.
    - A. The primary cooperators will ensure that coordination with Mexico occurs within the framework of the annual meetings of the Trilateral Commission, which is comprised of the United States, Mexico, and Canada.
    - B. Through JAGCT and the Trilateral Commission, Mexico will be encouraged to determine the present distribution and status of jaguars and jaguar habitats within its boundaries, and to identify possible jaguar travel corridors into Arizona and New Mexico. As relevant information becomes available from Mexico, JAGCT will generate a distribution map to assess the natural recolonization potential for Arizona and New Mexico.
  5. Identify, maintain, and promote existing and other suitable jaguar habitats.
    - A. JAGCT members will staff a technical committee to review relevant scientific literature, and to incorporate findings from current jaguar studies, to identify habitat use-patterns, and thus develop range-wide habitat suitability criteria applicable to habitats of northern Mexico and adjacent Arizona and New Mexico. Habitat suitability will vary, depending on recency of jaguar occupancy, prey density, habitat composition, human exploitation, and geo-physiographic area. Review of scientific literature will begin within 30 calendar-days of establishment of JAGCT, and shall be completed within 90 calendar-days.

These habitat suitability criteria will be essential to determining the importance of habitats in northern Mexico and adjacent Arizona and New Mexico, and to identifying areas in Arizona and New Mexico that are, or might become, suitable for occupancy by jaguars.
    - B. Cooperator reviews to determine impacts of proposed projects and activities on jaguars and jaguar habitats:
      - (1) Within 30 calendar-days of accepting the above-mentioned review of the available scientific literature, the JAGCT will:

- (a) Provide each land management agency cooperator with guidelines for conducting an assessment of the impacts of its current and planned actions on the jaguar and its currently known or suspected habitat in Hidalgo, Cochise, Pima, and Santa Cruz counties.
  - (b) Provide each cooperator with a completion deadline for its assessment, not to exceed 90 calendar-days, as appropriate to the total area and activities to be evaluated.
  - (c) For its assessments, the Arizona State Land Department will use the project specific notification/response process currently in use by its leasing and sale administrators.
- (2) Within 90 calendar-days of completing its initial assessment of current and proposed activities, each cooperating land management or wildlife agency will evaluate the potential impacts on jaguars and jaguar habitat of each new project proposed to be carried out within Hidalgo, Cochise, Pima, and Santa Cruz counties. These evaluations will be submitted to the JAGCT for review, but may be carried out and reported in conjunction with Section 7 consultations on other species, or as separate documents.
  - (3) The JAGCT will respond in writing to the above-mentioned reports within 60 calendar-days of receipt, with recommendations on how to address any impacts or concerns.
- C. Beginning not later than 12 months after establishment of JAGCT, AGFD and NMGFD will coordinate with federal land management agencies, state land department, and private landowners to conduct jaguar habitat inventories. At a minimum, these inventories will consider population levels of all wildlife likely to be important prey for jaguars, and inter-connecting travel corridors that are or might be important to jaguars.
- Habitat inventories or other studies pursuant to this Strategy shall not occur on private lands without prior permission from the landowner.
- D. Not later than 24 months after establishment of the JAGCT, AGFD and NMGFD will produce state-specific maps delineating land ownership patterns overlaid with suitable jaguar habitat, insofar as such habitat can be delineated at that time. Private lands on such maps will not be identified as to individual owners. These maps will be a primary basis for evaluating constraints to, and opportunities for, jaguar habitat management within each state.

- E. Through JAGCT and JAGWG, AGFD and NMGFD will encourage federal, state, and private land managers to conserve or enhance suitable or potentially suitable habitat, including corridors connecting these habitat blocks, to ensure that the jaguar's current and future habitat needs (including natural dispersal and habitat expansion) are appropriately addressed in Arizona and New Mexico. In doing so, the cooperators will consider state, federal, and private cooperation, funding sources, and availability of suitable habitat.
- F. AGFD and NMGFD will pursue protection and enhancement agreements for suitable jaguar habitat with federal and state land managers and willing private landowners, where such protection will address conservation objectives for the jaguar. Condemnation shall not be used as a land protection mechanism. Examples of voluntary habitat agreements that may be struck are: AGFD Stewardship Agreements; USFWS Partners for Wildlife Agreements; and conservation easements among private organizations and government agencies.

Efforts to design or implement habitat protection or other conservation measures for private lands shall occur only in response to invitation from the landowner(s). Private property owners shall not be involuntarily subject to any such protection or enhancement agreement.

- G. AGFD and NMGFD, in cooperation with the JAGCT and JAGWG, will monitor and identify new, continued, or diminishing threats to jaguar population expansion.
- H. Livestock depredation and control measures.
- (1) It is understood by all cooperators that predator control activities are subject to a variety of federal and state laws, local ordinances, and oversight by various federal and state land management, wildlife management, and agricultural agencies or programs. Thus, any JAGCT discussions or recommendations regarding predator control must be carefully coordinated with those entities.
  - (2) Private property owner claims for compensation for livestock lost to jaguar depredation will be referred to the Malpai Borderlands Group for payment from a fund established for that purpose. Procedures for confirmation of losses to be recommended for compensation will be established by the JAGCT within 60 calendar-days of execution of the JAGMOA.
  - (3) Within 60 calendar-days of execution of the JAGMOA, APHIS-ADC in Arizona and New Mexico and the New Mexico Department of Agriculture will complete and submit to the JAGCT a risk assessment documenting: all use of M-44s in Cochise, Pima, Santa Cruz, and Hidalgo counties over the

past five years; the number and species of felids taken by such methods; the amount of area worked in those counties; and expert opinion on what baits would be most effective in conjunction with M-44s and least likely to attract jaguars. The results of this assessment will be used by the cooperators to determine whether additional guidelines and/or mitigation measures for use of M-44s by APHIS-ADC personnel and/or private M-44 applicators should be implemented within the range of the jaguar.

- (4) For purposes of predator control in Hidalgo, Cochise, Pima, and Santa Cruz counties, employees supervised by APHIS-ADC will not use leghold traps with a jaw spread larger than a #3 Victor. The #3 Victor and equivalent or smaller leghold traps are too small to hold a jaguar.
  - (5) In the event that APHIS-ADC agents kill, or cause debilitating injury that precludes successful release of, a jaguar during lawfully authorized predator control activities: the incident shall immediately be reported to the primary cooperators; the capture method resulting in such take will cease immediately within five miles of the take location and within five miles of any other location of a confirmed reliable jaguar occurrence within the preceding six months; and, APHIS-ADC will consult with the primary cooperators to determine how to proceed and whether additional guidelines and/or mitigation measures should be established for use of such methods in Cochise, Pima, Santa Cruz, and Hidalgo counties.
  - (6) Each state wildlife agency, in cooperation with the JAGCT and the JAGWG, will coordinate with the Arizona and New Mexico Departments of Agriculture, APHIS-ADC, and the County Extension Services of Arizona and New Mexico to review wildlife depredation control measures practiced within Hidalgo, Cochise, Pima, and Santa Cruz counties to ensure that they do not compromise jaguar occurrence in, or population expansion into, Arizona and New Mexico.
6. Promote scientific jaguar management and public education.
- A. The JAGCT will work toward providing an improved and sound scientific basis for jaguar management and an avenue for enhanced technical information exchange. Toward that end, it will establish a non-cooperator affiliated Jaguar Scientific Advisory Group (JAGSAG) to review its survey and research findings and its management recommendations. In establishing the JAGSAG, the JAGCT will give preference to:
    - (1) Credentialed scientists who have published peer-reviewed professional journal articles on their studies of the biology and conservation of the jaguar

or other large carnivores; and

- (2) Persons with relevant expertise in livestock management, if livestock management practices and/or depredation are addressed in the JAGCT's management recommendations.

B. The JAGCT will promote public support of jaguar conservation through development and distribution of informational and educational material (see examples below). Jaguar conservation efforts must have the support of an informed public throughout the species' range in Arizona, New Mexico, and Mexico. Public support will enhance funding opportunities and facilitate implementation of this Strategy. The public that will be targeted for information and education efforts will include wildlife viewers, hunters, ranchers, farmers, other private landowners, conservation groups, and local governments.

- (1) All educational materials developed by or for the JAGCT shall be:
  - (a) Reviewed by professional educators with appropriate expertise, the JAGWG, and/or a subcommittee established by the JAGCT; and
  - (b) Approved by the JAGCT.
- (2) Specific information and education actions that will be taken include:
  - (a) AGFD and NMGFD will increase promotion of their 24-hour "hot lines" (1-800 numbers) for reporting wildlife violations, and rewards for information that leads to convictions. Private donations will be sought to supplement the rewards offered by the state agencies for convictions in cases of unlawful take of jaguars.
  - (b) The Arizona Game and Fish Department, Defenders of Wildlife, Arizona Cattle Growers' Association, Malpai Borderlands Group, and any other group that desires to participate will fund and produce a scripted slide show on jaguar conservation.
  - (c) AGFD and NMGFD will, at a minimum, produce and distribute: a jaguar conservation brochure, for distribution through hunting license vendors and other outlets; a jaguar fact sheet summarizing the status of the species and its conservation needs; a "no open season" advisory in annual hunting regulations booklets; a periodic newsletter on the JAGCT and related activities; a World Wide Web home page status summary; jaguar conservation articles for their agency magazines; and a segment on the jaguar conservation effort for the *Arizona Wildlife Views* television show.



7. Increase legal protection.
  - A. Within 12 months of execution of the JAGMOA, AGFD and NMGFD will each initiate attempts to increase their state legal disincentives for unlawful take of jaguars. In both states, these actions will, at a minimum, include recommending civil damage assessments comparable to or in excess of current civil penalties under ESA. They may also include recommending increased criminal penalties (fines and prison terms) for unlawful take.
  - B. Within 60 calendar-days of execution of the JAGMOA, the Arizona Game and Fish Department will consider whether changes are needed in A.R.S. 17.239 to preclude legal killing of jaguars as stockkillers.
  - C. Within 60 calendar-days of execution of the JAGMOA, the Service will consider whether listing the jaguar via the "similarity of appearance" clause of ESA (Section 4(e)) is appropriate. Such listing would allow invocation of the civil and criminal penalties under Section 9 of the Act for unlawful take, but would not provide for designation of critical habitat or invoke other provisions of ESA.
  
8. Evaluation of progress and accomplishments.
  - A. In January of each year following execution of the JAGMOA, the Directors of AGFD and NMGFD will jointly issue a written report on activities implemented to date to conserve the jaguar. The report will be submitted to the Service, and made available to all interested parties. Within 60 calendar-days of receipt of each report, the Service will inform the states in writing of any areas in which progress is not sufficient to warrant continuation of this Strategy. If such deficiencies are identified, within 90 calendar-days of notification the primary cooperators will jointly determine whether to implement mutually acceptable curative measures.

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