Submitted electronically via www.regulations.gov, docket # FWS-R2-ES-2009-0091

March 15, 2010

Re: Jaguar critical habitat comments in response to FR vol. 75, no. 8 (Jan. 13, 2010).

To Whom it May Concern,

I. Introduction. We request that the U.S. Fish and Wildlife Service designate critical habitat for the endangered jaguar in specific regions in California, Arizona, New Mexico and Texas based on preliminary assessments of potential jaguar habitat in the U.S., and on other available information on jaguar habitat use. The areas we recommend for critical habitat designation are not the entirety of what has been mapped or is likely to be identified in future mapping, as potential jaguar habitat in the U.S. Rather, these areas are still potentially connected to jaguar habitat and jaguar populations in Mexico, and exclude smaller areas with limited connectivity to the larger swaths of habitat. If designated as critical habitat, these landscapes will enhance the ability of jaguars in Sonora and Chihuahua, Mexico to expand their range northward, including expanding their breeding range. This would enhance the northern jaguar population's chance of survival and recovery by conserving habitat that could potentially support dozens if not hundreds of jaguars.

Due to the preliminary nature of the mapping that has already occurred under the auspices of the Jaguar Conservation Team, and the absence thus far of any guidance from an as-yet unappointed jaguar recovery team, we recommend that after an initial designation of critical habitat, the Fish and Wildlife Service should prepare to revise the designation and expand the critical habitat. Nonetheless, our recommendations herein, if adopted, will ensure that Federal actions do not compromise the minimal area in the United States that can be conceived of as necessary to significantly enhance the prospects of conservation of a northern jaguar population.

Conserving the existing northern jaguar population that is based in Mexico, and expanding its breeding range to the areas of the U.S. that we recommend for critical habitat designation, would ensure the jaguar's persistence in ecological types which it used to inhabit but is increasingly rare in or entirely extirpated from today. These vegetation associations include Petran subalpine conifer forest, Petran montane conifer forest, Madrean evergreen woodland, Arizona upland subdivision, Interior chaparral, Great Basin conifer woodland, Great Basin desertscrub, Semidesert grassland, and Plains and Great Basin grassland. The American Society of Mammalogists noted in a 2007 resolution that "ecosystems in the United States in

which jaguars formerly occurred are not intact without the sustained presence of jaguars (Ray et al. 2005)."[1]

Just as these areas are not intact without their jaguars, so jaguars need them. The mammalogists also stated in their resolution: "[H]abitats for jaguars in the United States, including Arizona and New Mexico, are vital to the long-term resilience and survival of the species (Channell et al. 2000), especially in response to ongoing climate change."[2]

II. Critical habitat designation must encompass areas necessary for recovery of the jaguar. Critical habitat provides significant benefits to listed species like the jaguar because it is an essential tool for species recovery, because it mandates a higher habitat conservation standard during Endangered Species Act section 7 consultations, and because it provides detailed, practical guidance on the location of areas essential to the conservation of listed species. Critical habitat has proven to be a very effective conservation tool: Species with critical habitat are less likely to be declining, and over twice as likely to be recovering as those without.[3]

In recognition that habitat loss is the primary threat to 85% of all endangered species, Congress amended the ESA in 1978 to require the designation of mapped critical habitat areas for all listed species. Congress envisioned critical habitat as a recovery tool, requiring that it encompass all lands and water essential to the recovery of listed species. Congress clearly intended that critical habitat do more than other sections of the ESA devoted to preventing extinction: "It is the Committee's view that classifying a species as endangered or threatened is only the first step in insuring its survival. Of equal or more importance is the determination of the habitat necessary for that species' continued existence. ... If the protection of endangered and threatened species depends in large measure on the preservation of the species' habitat, then the ultimate effectiveness of the Endangered Species Act will depend on the designation of critical habitat."[4]

The courts have reached similar conclusions: "[T]he designation of critical habitat serves as the principal means for conserving an endangered species, by protecting not simply the species, but also the ecosystem upon which the species depends."[5] The court further noted that fourteen courts have rejected the Service's argument that other provisions of the ESA provide equivalent protection to critical habitat.[6] According to the Tenth Circuit: "[C]ritical habitat designations serve to protect species vulnerable to extinction. Without a designated critical habitat, the ESA's requirement that '[e]ach Federal agency shall ... insure that any [of its actions] is not likely to ... result in the destruction or adverse modification of [critical] habitat,' 16 U.S.C. § 1536(a)(2), becomes unenforceable."[7]

Designation of critical habitat adds a level of protection not otherwise available to species like the jaguar which are threatened by habitat destruction or modification. These species are protected by provisions which apply to all listed species, but are further protected by a set of

1 Conservation of jaguars in North America. Journal of Mammalogy, 88(6):1574, 2007.
2 Ibid.
3 Taylor, M.F.J., Suckling, K.F. & Rachlinski, J.J., 2005. The effectiveness of the Endangered Species Act: a quantitative analysis. BioScience 55(4): 360-367.
4 House Committee on Merchant Marine and Fisheries, H.R. Rep. No. 887, 94th Cong. 2nd Sess. at 3 (1976)
5 Center for Biological Diversity et. al. v. Norton, 240 F. Supp. 2d 1090, 1101 (D. Ariz. 2003).
6 Ibid, 14.
7 Forest Guardians v. Babbitt, 174 F.3d 1178, 1185-86 (10th Cir. 1999) (petition for rehearing and rehearing en banc denied)

provisions which apply only to designated critical habitat. According to the Fish and Wildlife Service:

> The designation of critical habitat ... is one of several measures available to contribute to the conservation of a species. Critical habitat helps focus conservation activities by identifying areas that contain essential habitat features (primary constituent elements) regardless of whether or not they are currently occupied by the listed species. Such designations alert Federal Agencies, States, the public, and other entities about the importance of an area for the conservation of a listed species. Critical habitat can also identify areas that may require special management or protection. Areas designated as critical habitat receive protection under Section 7 of the Act with regard to actions carried out, funded, or authorized by a Federal Agency which are likely to adversely modify or destroy critical habitat. The added protection of these areas may shorten the time needed to achieve recovery."[8]

Section 7 of the Endangered Species Act contains two distinct mandates. First, it requires that all federal agencies insure that their actions are "not likely to jeopardize the continued existence of any endangered species or threatened species." Second, it mandates that agencies refrain from taking actions likely to "result in the destruction or adverse modification of habitat" that has been determined by the Secretary of the Interior to be critical.[9] According to the current definition of "jeopardy," the first mandate prohibits only those actions which threaten the survival of an entire species. In contrast, the ESA defines critical habitat as an area essential to the <u>recovery</u> of a species. Courts have upheld this interpretation:

> [T]he Court finds that congressional intent in enacting the ESA was clear: critical habitat exists to promote the recovery and survival of listed species where they are threatened separately, as well as where they are 'both' threatened. Under the ESA, "critical habitat" is the area 'essential' for 'conservation' of listed species. 16 U.S.C. 1532(5)(A). Conservation means more than survival; it means recovery. The regulatory definition of recovery closely resembles the ESA's definition of conservation: "conservation" is "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided [by the ESA] are no longer necessary." 16 U.S.C. § 1532(3). "Recovery" means "improvement in the status of listed species to the point at which listing is no longer appropriate."[10]

And: "The Court finds that the proper definition of 'destruction or adverse modification' is: 'a direct or indirect alteration of critical habitat which appreciably diminishes the value of that habitat for <u>either the survival or the recovery</u> of a listed species."[11]

Critical habitat also carries a very valuable, practical educational value. Many agencies actively rely on critical habitat as guidance to conserve listed species. For example, the San Bernardino National Forest and Bureau of Land Management have discontinued grazing in Peninsular bighorn sheep critical habitat. The Bureau of Land Management has scaled back

8 Determination of critical habitat for the Northern spotted owl (57 Federal Register 1796)
9 16 U.S.C. § 1536(a)(2)
10 Am. Motorcycle Ass'n Dist. 37 v. Norton, No. C 03-03807 SI, No. C 03-02509 SI , (N.D. CA 2004).
11 Ibid.

grazing, mining and off-highway vehicle use in desert tortoise critical habitat. The Gila National Forest has discontinued grazing in southwestern willow flycatcher critical habitat. There are many other such instances. It is incumbent on the Fish and Wildlife Service to identify and designate jaguar critical habitat in areas sufficiently large to support more than just a few jaguars. Even if one cannot calculate precisely how many jaguars might subsist on U.S. habitats, the designation must contain enough land to significantly aid the northern jaguar population's recovery. A 2004 analysis of potential jaguar habitat in the U.S. concluded: "Range expansion [northward] could help prevent genetic isolation and extinction of the northern jaguars and also increases chances for long-term survival of this species in the face of global anthropogenic changes."[12] The same study also concluded:

> [A]s top predators, jaguars can serve as indicators of the success of land management policies and practices that help maintain biological resources in the United States and Mexico. By maintaining connectivity across subtropical and temperate zones, conservation of jaguars would help conserve a number of other species and preserve the biological integrity of the unique Madrean region.[13]

III. The jaguar's historic range in the United States was extensive. Though the Fish and Wildlife Service accepts that jaguars were native to California, Arizona, New Mexico, Texas and possibly Louisiana, the agency has cited to an assessment that the absence of Native American and early Eureopean jaguar references indicates in part the lack of permanence of jaguars on U.S. landscapes over the past several hundred years.[14] To the contrary, Native American knowledge of jaguars was widespread and helps affirm the jaguar's longstanding tenure in North America. Jaguars were ubiquitous in stories, art and rituals among the various Native American tribes in the Southwest.[15] Furthermore, there is a substantial geographic overlap between anthropological and historical (as well as paleontological) records of jaguars, suggesting that the jaguar's historical range until about the year 1700 included the Ohio Valley, Colorado and southern California, as well as the Southwest.[16]

Just like the anthropological record, the historical record from explorers and settlers also suggests a dramatically more extensive distribution of the jaguar in North America in the 1700s and 1800s than now, including in the southeastern U.S.. In 1700 "tygers" (distinguished from "panthers") were reported at the headwaters of the Santee River in today's South Carolina and further east in what was likely today's Lancaster County, South Carolina or Union or Mecklenburg counties, North Carolina.[17] In 1737, "tygers" (described as "most beautifully

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12 Boydston, E. E. and C. A. Lopez Gonzalez. 2005. Sexual differentiation in the distribution potential of northern jaguars (*Panthera onca*). In: Connecting mountain islands and desert seas: biodiversity and management of the Madrean Archipelago II. 2004 May 11-15; Tucson, AZ. Proceedings RMRS-P-36. G. J. Gottfried, B. S. Gebow, L. G. Eskew & C. Edminster (eds.). U. S. Forest Service. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station, pp. 51-56.[Proceedings]

13 Ibid.

14 U.S. Fish and Wildlife Service. 2006. Federal Register, vol. 71, no. 133 (7/12/2006).

15 Pavlik, S. 2003. Rohonas and spotted lions: the historical and cultural occurrence of the jaguar, *Panthera onca*, among the native tribes of the American Southwest. Wicazo Sa Review. Spring 2003:157-174.

16 Daggett, P.M. and D.R. Henning. 1974. The jaguar in North America. American Antiquity. 39(3): 465-469.

17 Lawson, J. 1714. The History of Carolina, Containing the Exact Description and Natural History of that Country : Together with the Present State Thereof. And a Journal of a Thousand Miles, Travel'd Thro' Several Nations of Indians; Giving a Particular Account of their Customs, Manners, &c. London: W. Taylor and J. Baker, pp. 11, 13, 48.

mottled with several kinds of spots" and "large, strong and swift Beasts") were still reported as present and one as having been killed in the same region.[18] In 1825 the jaguar's range was described as including "east of the Mississippi."[19] A jaguar was reported as killed along the Brazos River in east Texas in the 1850s,[20] and in Louisiana in 1886.[21]

Jaguars were also described in the southern Rocky Mountains, including the "head waters of the Rio Grande"[22] and in December 1843 at the headwaters of the Platte River, where a trapper observed "a strange looking animal . . . of the leopard family," a species "not unfrequently met with in some parts of the Cumanche country [where] their skins furnish to the natives a favorite material for arrow-cases."[23]

Comanches on the southern Great Plains indeed used jaguar skins during this period precisely for that purpose, as attested by a German naturalist who saw them "wearing jaguar skin quivers" along the San Saba River in Texas as well as observing Delaware Indians in San Antonio selling pelts from two locally-killed jaguars for $18 apiece.[24] In 1853, on the Canadian River in northern Texas, near the 100th Meridian, an Army Lieutenant reported "a large tiger."[25] In 1905, Vernon Bailey, working for the Fish and Wildlife Service's predecessor agency Bureau of Biological Survey, recorded details of jaguars killed throughout Texas, including areas of the Great Plains, and in 1911, Bailey recorded another jaguar killed the previous year near London, Texas – also on the plains.[26] John James Audubon mentions a jaguar encounter "on the head waters of the San Marco."[27] A jaguar was also killed, and its pelt reported, sometime prior to 1938 on the plains of northeastern New Mexico.[28]

Finally, jaguars were also reported along the California coast as far north as the region between San Francisco and Monterey, as well as in the Tehachapi Mountains and mountains and deserts further south in California.[29]

Collectively, these historic accounts strongly suggest that rather than being marginal along the U.S. – Mexico border and impermanent., jaguars extended many hundreds of miles into the interior U.S., and that any peripheral jaguars may have been those roaming in the Southeast, Midwest, Great Plains, southern Rocky Mountains, and central coast of California. In contrast, jaguars in the "borderlands" would likely have been part of a much broader breeding population and not transient in the U.S..

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[18] Brickell, J. 1737. The Natural History of North Carolina. Dublin, p. 114.

19 Harlan, R. 1825. Fauna Americana. Anthony Finley, Philadelphia, p. 96.

[20] Baird, S.F. 1959. Mammals of the Boundary, United States and Mexican Boundary Survey, p. 7.

[21] Nowak, R.M. 1973. A possible occurrence of the jaguar in Louisiana. Southwestern Naturalist 17(4): 430-432.

[22] Audubon, J.J. and J. Bachman. 1854. The Quadrapeds of North America, vol. III, p. 9.

[23] Sage, R.B. 1857. Rocky Mountain Life. Donohue, Henneberry, and Co., Chicago; Seton, E.T. 1920, p. 346. The Jaguar in Colorado. Journal of Mammalogy. 1(5).

[24] Roemer, F. 1849. Roemer's Texas, appendix (translated from the German language edition at the Geology Library, UT Austin by Helga H. von Schweinitz).

[25] Foreman, G., ed. 1941. A Pathfinder in the Southwest: The Itinerary of Lieutenant A. W. Whipple. University of Oklahoma Press.

[26] Bailey, V. 1905. Biological Survey of Texas. Gvt. Printing Office, pp. 164-165; Bailey, V. 1911. A Jaguar in Texas. Forest and Stream, p. 6.

[27] Audubon, J.J. and J. Bachman. 1854.

[28] Hill, J.E. 1942. Notes on mammals of northeastern New Mexico. Journal of Mammalogy, 23(1): 75-82; Findley, J.S., A. H. Harris, D.E. Wilson and C. Jones. 1975. Mammals of New Mexico. University of New Mexico Press.

[29] Merriam, C.H. 1919. Is the jaguar entitled to a place in the California fauna? Journal of Mammalogy 1(1); Strong, W.D. 1926. Indian records of California carnivores. Journal of Mammalogy.

IV. Jaguar uses of habitat. As suggested by the breadth of their historic distribution in North America, jaguars use a wide variety of different types of habitats. The species seems able to adapt to any temperate undeveloped area with a sufficient prey base, hiding cover, and protection from or curtailment of human persecution. In Arizona, jaguars have been observed in scrub grasslands of souitheastern Arizona, in Madrean evergreen forest, Rocky Mountain montane conifer forest, and in Great Bansin conifer woodland.[30]

In xeric regions, such as the Sky Islands and to a lesser extent the Mogollon Rim and Gila headwaters, jaguar prey exists at lower densities and jaguars would thus be expected to establish significantly larger home ranges than in tropical rainforests. That was the case of the jaguar "Macho B," whose known range in the U.S. covered 1,359 km^2, including two mountain ranges.[31] (His actual home range, including in Mexico, was presumably even larger.) The extensive land used by individual jaguars in the southwestern U.S. suggests that a viable jaguar population spanning the U.S. - Mexico border will require commensurately larger landscapes – and suggests that one of the greatest challenges will be ensuring that jaguars can safely transit across vast areas.

In sum, an area is likely to be jaguar habitat in the southwestern U.S. if it contains the following physical or biological features: It is undeveloped, has the natural capacity to support jaguar prey such as deer or javalina, has geological features and/or is capable of growing vegetation that could provide hiding cover for jaguars, and is sufficiently large and well-connected to potentially contain at least dozens of jaguars' home ranges (with the sizes of those home ranges inversely proportional to the habitat's capacity to produce prey) and/or is situated so as to be functionally connected to jaguar habitat in Mexico or connected to larger blocks of jaguar habitat within the U.S. – as a metapopulation.

V. Threats to jaguar habitat. In listing the jaguar as endangered in 1997, the Fish and Wildlife Service acknowledged that "[c]learing of habitat, destruction of riparian aras, and fragmentation or blocking of corridors may prevent jaguars from recolonizing previously inhabited areas."[32] Today, jaguar habitat in the United States is undergoing rapid and in many instances near-irreversible destruction and fragmentation. This ongoing transformation may not only prevent jaguars from regaining historic range, but also threatens their northernmost remaining population in Sonora, Mexico, whose long term genetic viability may depend on interaction with additional jaguars that must eventually live in the United States

Since 2008, the U.S. Department of Homeland Security has installed multiple miles-long segments of a tall, double-layer steel wall along approximately 600 miles of the U.S. - Mexico border, partially severing habitats close to where jaguars were known to live in recent years,[33] and in other likely jaguar migration corridors, such as along the San Pedro River. The recent (and in Texas, ongoing) construction of this wall blocks jaguar and most other terrestrial animals' passage, and fragments habitat in a more ironclad manner than, for example, interstate

[30] Hatten, et al, p. 14.
[31] McCain, E. B. & J. L. Childs. 2008. Evidence of resident jaguars (Panthera onca) in the southwestern United States and the implications for conservation. Journal of Mammalogy, 89(1):1-10.
[32] U.S. Fish and Wildlife Service. 1997. Federal Register, vol. 62, no. 140 (7/22/1997).
[33] McCain & Childs 2008.

freeways which imperil any jaguar crossing them but do not preclude successful crossings. More segments of wall may be constructed in the future. And even in areas of the border that are not walled off, other border-security infrastrcture and activity diminish the ability of jaguars to cross the U.S. - Mexico border and reach habitats in the United States. These border-security factors include (but are not limited to) stadium-style lights, roads, and off-road vehicle use, all of which may deter jaguars from crossing the border.

Jaguar habitat is also undergoing fragmentation, adverse modification, and outright destruction due to a multitude of other factors including exurban development and increased vehicular access through roads and off-road vehicle use. In general, roads harm native species and ecosystem function.[34] In Canada, studies have shown that collisions with vehicles are a significant cause of mortality for large carnivores[35] Studies of a wide variety of species demonstrate that high road densities lower the likelihood of wildlife persistence due to an aversion to roads or negative impacts from increased human hunting, poaching, and harassment.[36] Indirect impacts from roads such as habitat fragmentation, direct habitat loss, increased human development, increased motorized access, and habitat displacement also account for substantial human-caused mortality of predators.[37] Roads and road density are likely to also affect jaguars indirectly, via their impacts upon prey species such as deer, javalina and elk.

Excessive road access in even the most remote areas of the Southwest potentially threatens establishment of a viable jaguar population. Nearly 80% (>800,000 hectares) of the Apache-Sitgreaves National Forest and nearly 72% of the Gila National Forest (~790,000 hectares) are open to off-road vehicles.[38] Off-road vehicle drivers are creating new vehicle routes on a continuous basis out of pedestrian and equestrian trails and across open terrain. The proliferation of roads and vehicle routes modifies jaguar habitat by reducing areas in which

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[34] Schoenwald-Cox, C., and M. Buechner. 1992. Park protection and public roads. In P.L. Fielder, and S.K. Jain, eds. Conservation Biology: The theory and practice of nature conservation, preservation, and management. Chapman and Hall, New York, USA., 373-379; Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology* 14:18-35.

[35] Waters, D. 1988. Monitoring Program-Mitigative Measures. Trans Canada Highway Twinning. Km 0-11.4. Final Report. Banff National Park Warden Service. 57 pp; Kansas, J.L., R.M. Raine, and M.L. Gibeau. 1989. Ecological studies of the black bear in Banff National Park, Alberta, Final Report. Prepared for Parks Canada, Banff National Park. Beak and Associates Consulting Ltd.118 pp; Woods, J.G. 1991. *Ecology of a partially migratory elk population.* Ph.D. Thesis. University of British Columbia, Vancouver. 149pp; Gibeau, M.L. 1993. *Use of urban habitats by coyotes in the vicinity of Banff, Alberta.* M.S. Thesis. University of Montana, Missoula. 66pp; Paquet, P.C. 1993. *Summary reference document – ecological studies of recolonizing wolves in the Central Canadian Rocky Mountains.* Unpublished report by John/Paul and Associates. For Canadian Parks Service, Banff, Alberta; Thurber, J.M., R.O. Peterson, T.D. Drummer, and S. A. Thomasma. 1994. Gray wolf response to refuge boundaries and roads in Alaska. *Wildlife Society Bulletin* 22:61-61.

[36] Van Dyke, F.B., R.H. Brocke, H.G. Shaw, B.B. Ackerman, T.P. Hemker, and F.G. Lindsey. 1986. Reactions of mountain lions to logging and human activity. *The Journal of Wildlife Management* 50:95-102; Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. *Journal of Forestry* 81:592-595.

[37] Ruediger, B. 1996. The relationship between rare carnivores and highways. In G.L. Evink, P. Garrett, D. Zeigler, and J. Berry, eds. *Trends in addressing transportation related wildlife mortality. Proceedings of the Transportation Related Wildlife Mortality Seminar April 30, May 1& 2. 1996.* 17pp. Orlando, Florida.

[38] U.S. Forest Service. 2004. Biological Assessment for the 11 Land & Resource Mangement Plans, USDA Forest Service Southwestern Region, p. 84.

jaguars and their prey may be secure from poachers and from traffic. The relative impact of roads is influenced by a variety of factors, including type (dirt or paved) and width of road, volume and speed of traffic, and areal road density. But it is not just rough roads that are spreading throughout the landscape. In addition to new subdivisions and other local developments with their road networks being built throughout the Southwest, a new interstate is proposed to be constructed along the lower San Pedro valley of Arizona.

The 1997 listing rule acknowledged the continued loss of riparian areas that are important for jaguars. The riparian habitat of the upper San Pedro River is threatened as a result of the ongoing draining of the groundwater that supports the river; the water is being used for agriculture and for exurban development so even if jaguars were to bypass the border wall along the San Pedro, the river's ability to funnel jaguars and other wildlife northward is currently diminishing as the riparian area dries up. Similarly, the hundreds-feet-wide riparian bosque of the Gila River in New Mexico is threatened by a water-removal project that has not yet been constructed but that Congress authorized in 2004 and is currently being planned. Pumping plans for the upper Verde River threaten a desert riparian habitat downstream, including prey animals that jaguars must rely on.[39]

Livestock also degrade and destroy riparian habitats through overgrazing of grass, compacting of soils, consumption and trampling of the shoots of young trees, and through impacts on the streambank's morphology and ultimately the waterway's hydrology, which can reduce the stability of soils and their capacity to support vegetation. Loss of riparian trees, shrubs and grass along streams and rivers reduces or eliminates hiding cover for jaguars and also reduces the capacity of the habitat to support the animals that jaguars prey upon.[40]

Residential and commercial development, gargantuan open-pit copper mines and associated tailings ponds, and row-crop agriculture are destroying and adversely modifying the jaguar's habitat in the U.S., and will likely continue to do so at an even greater rate due to the exponential growth in the human population of the Southwest and globally. For example, copper mines and associated tailings ponds south and east of Silver City, New Mexico, at Morenci, Arizona,[41] and southwest of Tucson, Arizona[42] have obliterated jaguar habitat and curtail potential movement of jaguars between mountain ranges. Another such mine is being excavated north of Safford, Arizona, and another mine is being planned at the edge of the Santa Rita Mountains of Arizona. In addition to removing all vegetation at the mine sites themselves, development of these mines also entails de-watering rivers and streams.

With similar efficacy in fragmenting jaguar habitat, ongoing exurban development outside Silver City and Deming, New Mexico and Tucson, Arizona (among other towns) is likely to curtail jaguarss' access to and re-occupancy of historic ranges. Residential subdivisions increase vehicle use, further fragmenting wildlife habitats. Altogether, degradation of both

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[39] Pepin, D.M., N.L. Poff, and J.S. Baron. 2002. Ecological effects of resource development in running waters. Pages 113-132. In J.S. Baron, editor. *Rocky Mountain futures: an ecological perspective*. Island Press, Washington, D.C.

[40] Fleischner, T. 1994. Ecological costs of livestock grazing in western North America. Conservation Biology 8(3):629-644; Noss, R.F., and A.Y. Cooperrider. 1994. *Saving nature's legacy: Protecting and restoring biodiversity.* Island Press, Covelo, California, USA; Donahue, D.L. 1999. *The western range revisited: removing livestock from public lands to conserve native biodiversity*. University of Oklahoma Press, Norman.

[41] For more information, see: http://www.mining-technology.com/projects/morenci/ (Accessed July 14, 2009)

[42] For more information, see http://www.elmhurst.edu/~chm/vchembook/330copper.html (Accessed July 14, 2009).

riparian and upland habitats carries the seeds of many synergistically destructive effects, including diminishment of jaguar prey species and an increase in the probabilities that jaguars will prey on livestock and be killed as a result.

VI. Jaguar Conservation Team habitat subcommittee maps identify potential jaguar habitat in Arizona and New Mexico. The Jaguar Conservation Team's habitat subcommittee began working in 1998 to develop and refine criteria for what would constitute jaguar habitat in Arizona and New Mexico. As part of this exercise, the subcommittee consulted with the JCT's Scientific Advisory Group, and revised its draft criteria in response to the scientists' feedback. The subcommittee's final criteria for identifying suitable jaguar habitat were as follows:

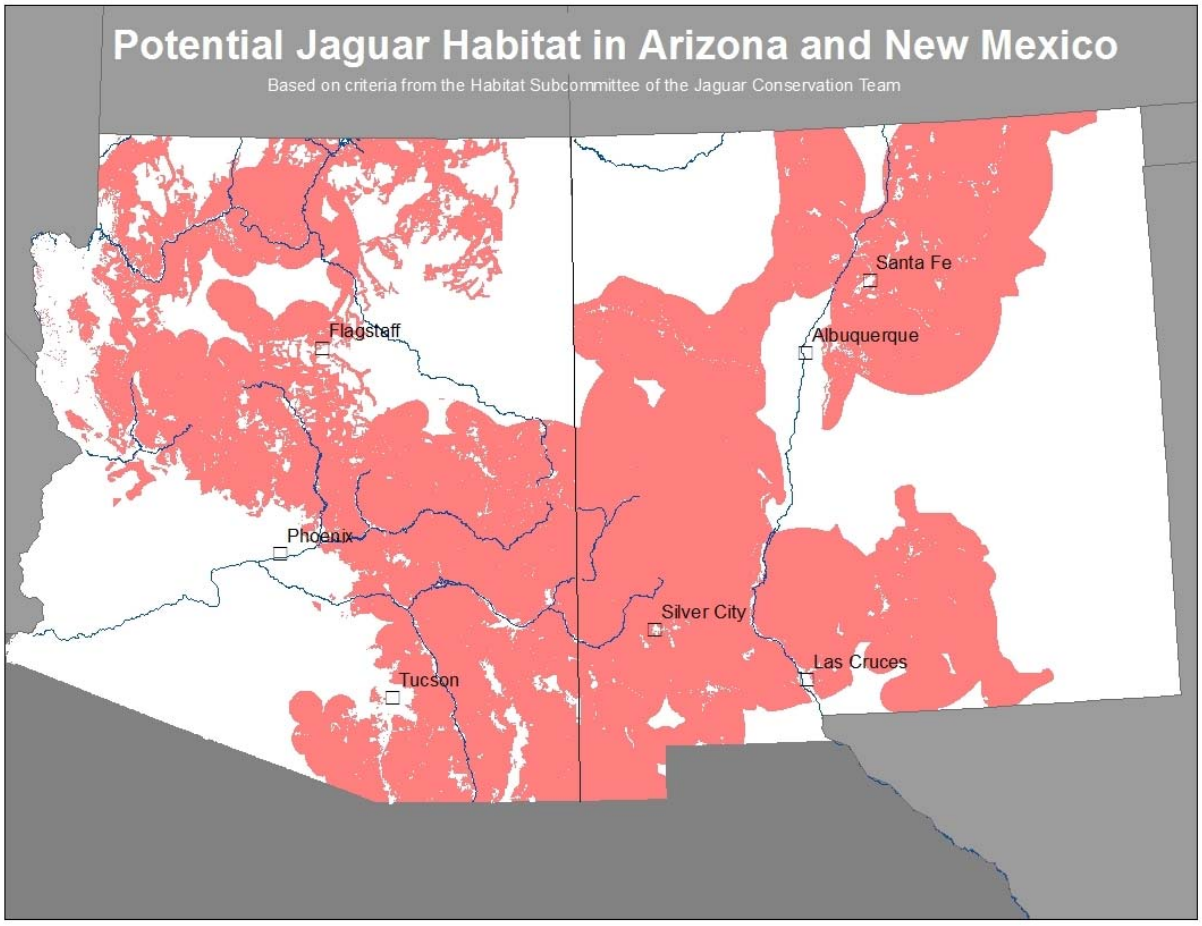
- Area being considered must be within 50 miles of a documented jaguar occurrence. This would include an entire mountain range, if a portion of that range is within 50 miles of the occurrence.
- Based on Brown and Lowe (1980) habitat associations, the area must be in the Semi-desert Grassland, Plains and Great Basin Grassland, Subalpine Grassland, Interior Chaparral, Madrean Evergreen Woodland, Great Basin Conifer Woodland, Petran Montane Conifer Forest, Petran Subalpine Conifer Forest, Chihuahuan Desertscrub, Arizona Upland Sonoran Desertscrub, or Great Basin Desertscrub. Areas in the Lower Colorado River Sonoran Desertscrub, Mojave Desertscrub, and Alpine Tundra are not considered jaguar habitat.
- Area must be within 10 miles of surface water, at least seasonally. Most areas within habitat associations listed in b. above have suitable water availability.
- Areas with continuous row crop agriculture over an area greater than 1 square mile and any agricultural crop areas immediately adjacent to those areas are not considered adequate habitat. Areas with human residential development in excess of 1 house per 10 acres are not considered jaguar habitat. Areas developed for industrial purposes or a combination of industrial and residential development that create a footprint equal to or greater than 1 house per 10 acres are not suitable jaguar habitat.[43]

Between 2002 and 2006, the JCT's habitat subcommittee developed a set of maps of potential jaguar habitat in Arizona and New Mexico, with accompanying reports summarized in a final report.[44] Among these maps were two maps which combined consist of the bi-state map, below (Figure 1), which "strictly apply" the "habitat criteria approved by the JAGCT."[45]

43 Robinson, M.J. 2006. Habitat for jaguars in New Mexico. Contract report to Arizona Game and Fish Department. Center for Biological Diversity. Silver City, New Mexico. On-line at: http://www.azgfd.com/w_c/es/documents/Jaguar.NMHabitatReport.CBD.200601.Final.pdf; pp. 9-10.

44 Van Pelt, W.E., Potential jaguar habitat in Arizona and New Mexico: Summary of Work and Recommendations of the Jaguar Habitat Subcommittee of the Jaguar Conservation Team. 2006. On-line at: http://www.azgfd.com/w_c/es/documents/JAGHABSummaryReport.20060413.Final.pdf.

45 Van Pelt, 2006, p. 7.



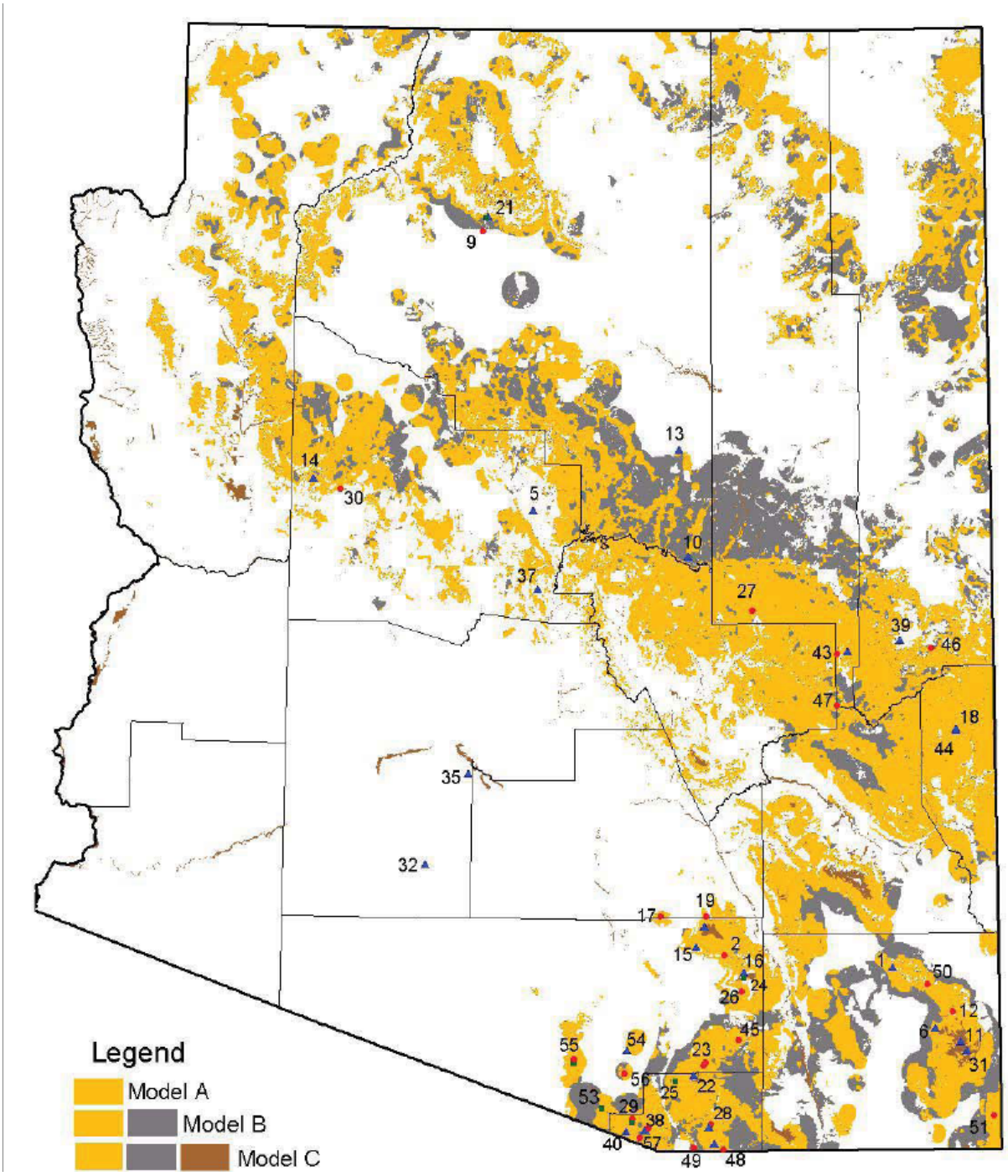
[Figure 1.] Center for Biological Diversity map developed for the Jaguar Conservation Team's habitat subcommittee that depicts potential jaguar habitat according to the criteria approved by the subcommittee.

In addition, the New Mexico and Arizona game agencies each developed jaguar habitat maps[46] of their respective states for the JCT habitat subcommittee, each using an "alternative analysis not based on the habitat criteria approved by the JAGCT."[47] The primary differences in the criteria the state agencies used was in delimiting jaguar habitat through a terrain ruggedness index that excludes or limits areas if they are not sufficiently steep or rugged. Moreover, the New Mexico Department of Game and Fish introduced several other changes from the habitat subcommittee's criteria: The analysis excluded jaguar occurrence records in Colfax and Otero counties. It assigned greater value to Madrean evergreen woodland habitats in its analysis,

46 Hatten, J.R., A. Averill-Murray, and W.E. Van Pelt. 2002. Chracterizing and mapping potential jaguar habitat in Arizona. Nongame and Endangered Widllife Program Technical Report 203. Arizona Game and Fish Department, Phoenix, Arizona. On-line at http://www.azgfd.gov/pdfs/w_c/jaguar/characterizing_mapping.pdf; Menke, K.A. and C.L. Hayes. 2003. Evaluation of the relative suitability of potential jaguar habitat in New Mexico. New Mexico Department of Game and Fish. Santa Fe, New Mexico. On-line at http://www.azgfd.gov/pdfs/w_c/jaguar/JagRpt4%20doc.pdf.
47 Van Pelt, 2006, p. 7.

greater value to areas with multiple water sources and with perennial (as opposed to intermittent) water sources. And the analysis incorporated an assesment of jaguar prey density.[48]

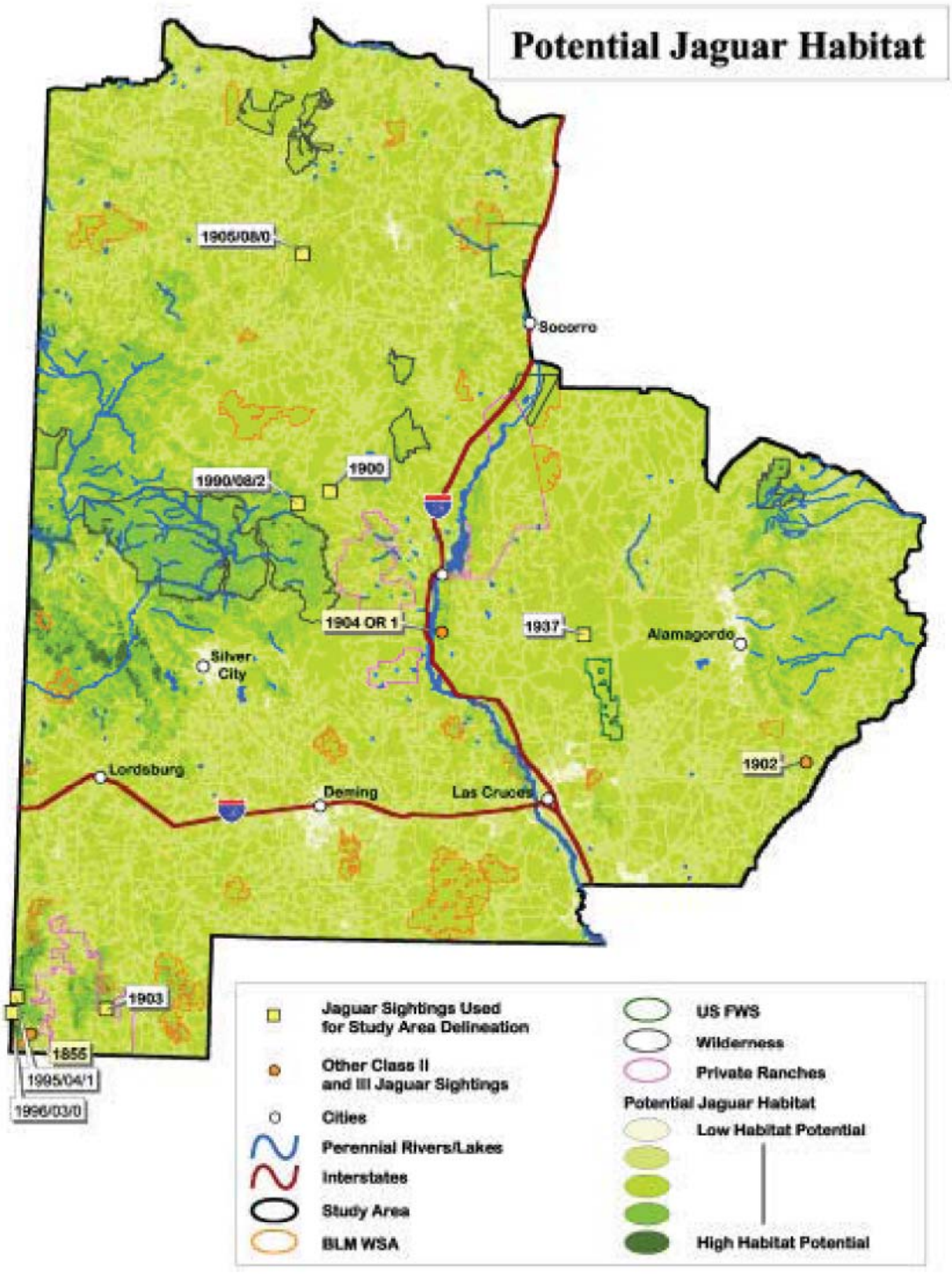
These state agency maps of potential jaguar habitat, Figures 2 & 3, below, depict subsets of the areas depicted in Figure 1.



[48] Menke & Hayes.

[Figure 2.] Hatten, J.R., A. Averill-Murray, and W.E.Van Pelt. 2002. Characterizing and mapping potential jaguar habitat in Arizona. Nongame and Endangered Wildlife Program Technical Report 203. Arizona Game and Fish

Department, Phoenix, Arizona; p. 21.



[Figure 3.] Menke, K.A. and C.L. Hayes. 2003. Evaluation of the relative suitability of potential jaguar habitat in New Mexico. New Mexico Department of Game and Fish, Santa Fe, New Mexico; p. 22.

Even before finalization of the habitat subcommittee's habitat criteria, in 2000, the students and faculty of the Sierra Institute Field Studies Program in Arizona (University of California Extension, Santa Cruz, CA) submitted a jaguar habitat report to the subcommitee.[49] The report was part of the package of maps and summary analysis in the subcommittee's eventual final report to the JCT.[50] The Sierra Institute report utilized much the same criteria as the habitat subcommittee was coalescing around, with the exception that applicable vegetative biomes were not listed. The Sierra Institute report found that "primary jaguar habitat" included the following "mountain ranges, associated canyons, riparian areas and major washes and wash complexes" –

- Baboquivari Mts.-Alter Valley washes
- Mountains and highlands surrounding the lower Santa Cxruz River
- Cienega Creek area and adjacent mountains
- Santa Catalina and associated mountain ranges to the southeast
- Upper Aravaipa Valley and nearby mountain ranges
- Chiricahua Mts. And associated ranges
- Southern Peloncillo Mts. with San Bernadino and Animas Valley wash complexes
- Central Arizona-New Mexico Mts. (Black River north to San Francisco Mts. and east to Leopold Wilderness-Mimbres Mts.)
- Animas Mts. and nearby ranges

"Examples of important connecting habitat (corridors) include" –

- Agua Verde Creek-Davidson Canyon (connecting Santa Rita and Rincon Mts.)
- San Pedro River and associated washes (connecting Santa Catalinas and Galiuro Mts., for example)
- Dos Cabezas Mtns. (connecting Chiricahua and Pinaleno Mtns.)
- Northern Peloncillo Mtns. (connecting the cetnral Arizona-New Mexico Mts. with th eborderlands area)
- San Simon wash complexes (connecting adjacent east and west mountain ranges.)[51]

The Sierra Institute map of jaguar habitat is depicted below (Figure 4):

[49] Sierra Institute. 2000. Jaguar habitat in southern Arizona and New Mexico: a report to the habitat committee of the Jaguar Conservation Team. T. Povilitis and C. Johnson, eds. Field Studies Program in Arizona, University of California Extension, Santa Cruz..
[50] Van Pelt, W.E., 2006.
[51] Sierra Institute, 2000.

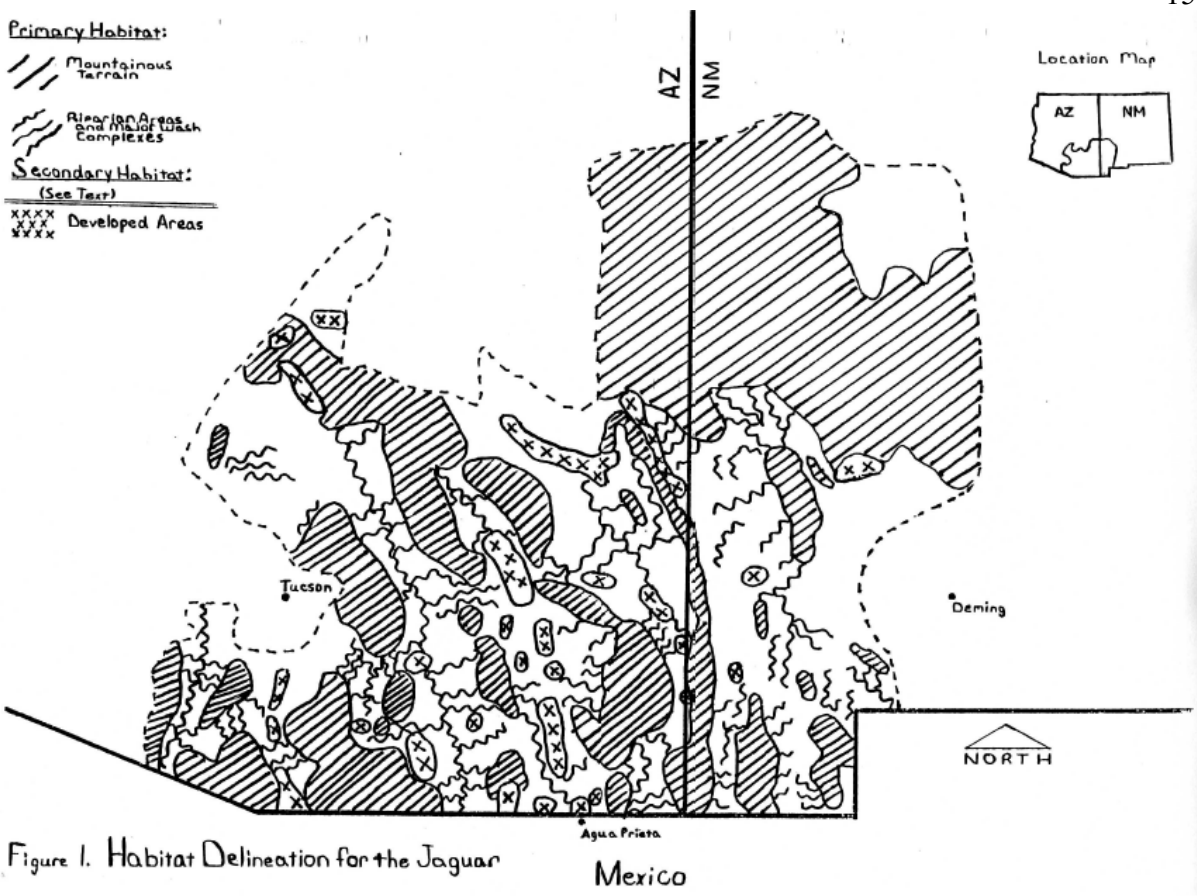


Figure 1. Habitat Delineation for the Jaguar

[Figure 4.] Sierra Institute. 2000. Jaguar habitat in southern Arizona and New Mexico: a report to the habitat committee of the Jaguar Conservation Team. T. Povilitis and C. Johnson, eds. Field Studies Program in Arizona, University of California Extension, Santa Cruz.

VII. Two other jaguar habitat models also identify habitat in Arizona and New Mexico. In addition to the Jaguar Conservation Team maps reproduced above (Figures 1, 2, 3 & 4), two other exercises sought to identify potential jaguar habitat in the United States. A 2005 study found areas on the Mogollon Rim and in the Sky Islands with some of the same geographic features as found in areas in which both male and female jaguars have been confirmed in the U.S. and Mexico (see Figure 4).[52] This study was based on a limited set of jaguar records, and did not include some records identified by the Jaguar Conservation Team's habitat subcomimittee and considered class II records (observations made by a reliable observer and/or accompanied by physical evidence). For example, the study did not incorporate the following records:

- a jaguar killed near Springer, New Mexico whose skin was in the collection of rancher Waite Phillips according to the report of a 1938 mammalogical collecting trip which Mr.

52 Boydston & Lopez Gonzalez, 2005.

Phillips extensively facilitated;[53] subsequent researchers accepted this report as valid as well.[54]

- August 25, 1990 observation by NM Highlands University biology professor Gerald Jacobi, Ph.D. and Donna Jacobi in the Gila National Forest immediately north of the Aldo Leopold Wilderness.[55]
- 1998 (date unrecorded) observation by Tom and Boe Duffy near the San Francisco River west of the Gila Wilderness.[56]
- May 1999 observation and accompanying plaster cast by John Trewern in the Burro Mountains south of Silver City.[57]

The study attempted to identify habitat elements that would separately support male and female jaguars, but only relied on six female jaguar records, all in Arizona. However, the study omitted at least one female jaguar reported by officials of the Biological Survey as killed in Arizona in the 1920s and a second female they believe had been poisoned as well[58] – and also omitted the aforementioned record of a female jaguar with young in the Tehachapi Mountains of California. The very limited data set, particularly for records of female jaguars, suggests limited utility for this method of identifying jaguar habitat and distinguishing male from female habitat niches. (And the authors warned: "There are important limits to the interpretation of our results."[59]) Nonetheless, this study's identification of potential jaguar habitat within the Sky Islands and the Mogollon Rim confirms that jaguars can live in these areas.

53 Hill, J.E. 1942. Notes on mammals of northeastern New Mexico. Journal of Mammalogy, 23(1): 75-82.
54 Findley, J.S., A. H. Harris, D.E. Wilson and C. Jones. 1975. Mammals of New Mexico. University of New Mexico Press.
55 Robinson, 2006.
56 Ibid.
57 Ibid.
58 Fisher, A.K. and W.B. Bell. 1927. Report of the committee on economic mammalogy, American society of mammalogists. Museum of Vertebrate Zoology, University of California at Berkeley. (See appendix.)
59 Boydston & Lopez Gonzalez, 2005, p. 55.

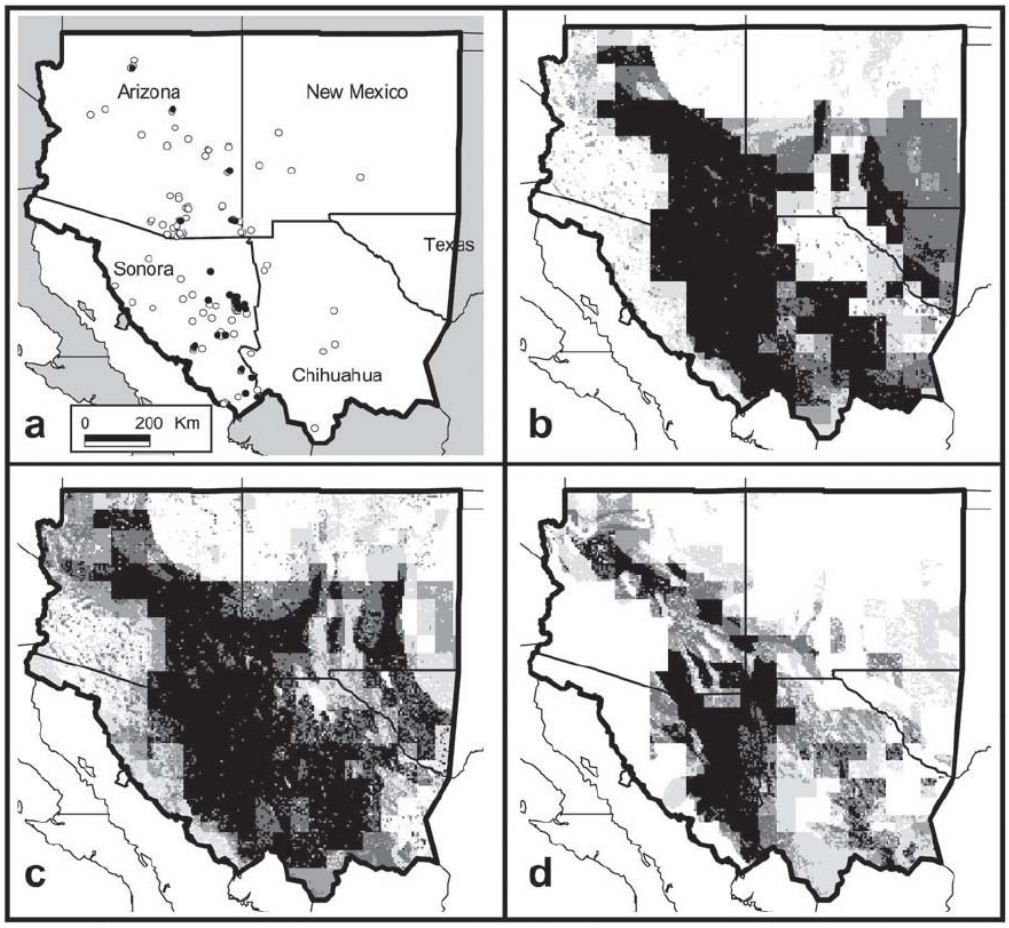


Figure 1—(a) Records of occurrence of male jaguars (open circles) and female jaguars (solid circles) in the study area which included all of Arizona, New Mexico, Sonora, Chihuahua, and the panhandle of Texas, shown in white with a bold outline. In (b), (c), and (d), the predicted distributions are shown in graduated shades representing confidence with black indicating where all 4 best subset models overlapped for distributions based on (b) all occurrence points, (c) male occurrence points only, and (d) female occurrence points only.

[Figure 5.] Boydston, E. E. and C. A. Lopez Gonzalez. 2005. Sexual differentiation in the distribution potential of northern jaguars (*Panthera onca*). In: Connecting mountain islands and desert seas: biodiversity and management of the Madrean Archipelago II. 2004 May 11-15; Tucson, AZ. Proceedings RMRS-P-36. G. J. Gottfried, B. S. Gebow, L. G. Eskew & C. Edminster (eds.). U. S. Forest Service. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station, pp. 51-56.[Proceedings]

In a different habitat-delineation exercise, in 1999, the Fish and Wildlife Service issued a formal Biological Opinion regarding the effects on jaguars in the United States of USDA Wildlife Services' poisoning, trapping, neck-snaring and hound-pursuit operations. The biological opinion limited the agency's operations within "occupied range" and "occupied habitat" of the jaguar. "Occupied range" in Arizona was defined as including all lands within Cochise and Santa Cruz Counties, Pima County east of Organ Pipe Cactus National Monument, Pinal County east of State Highway 77 and south of the Gila River, and Graham and Greenlee

Counties south of the Gila River. In New Mexico, "occupied range" was defined as Hidalgo County.[60]

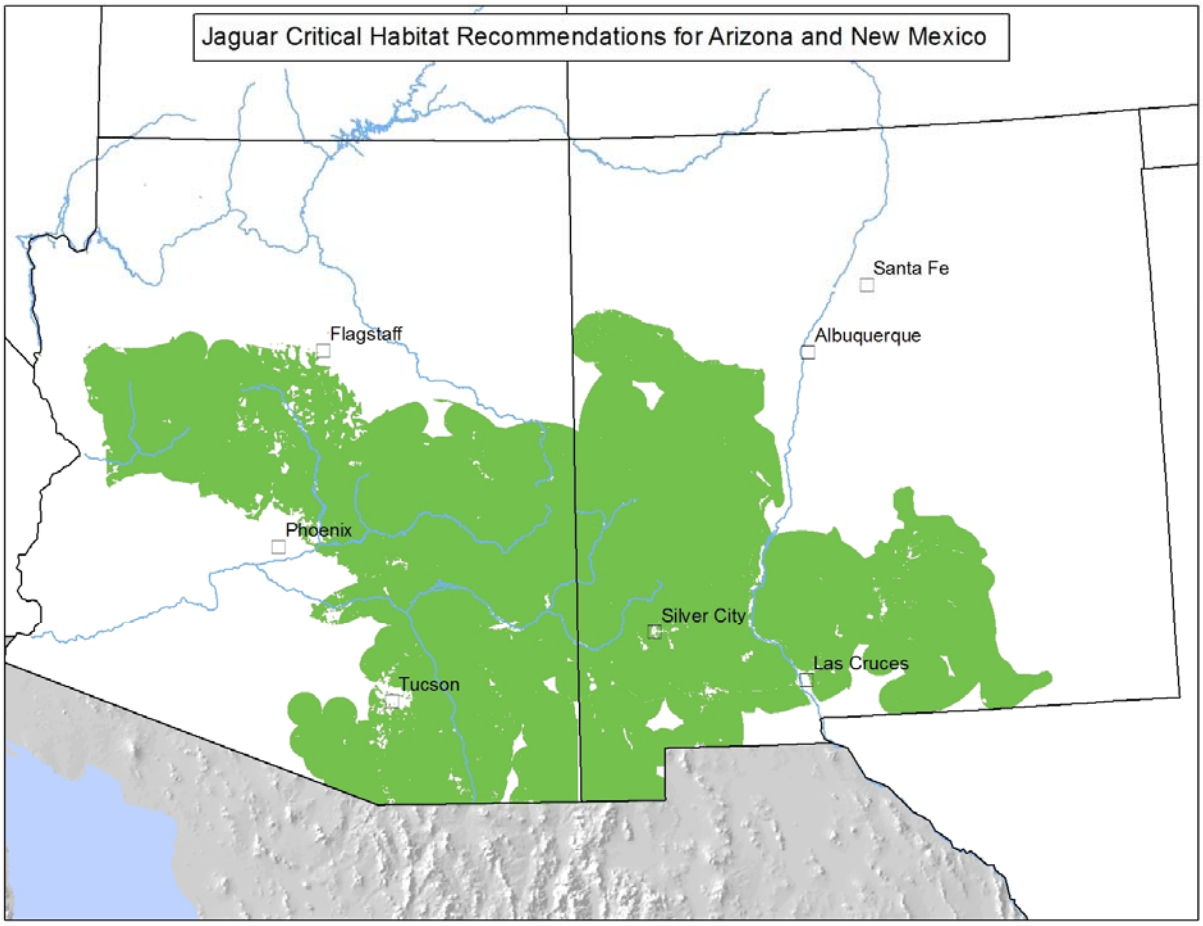
"Occupied habitat" was defined as the more limited region that excludes urban areas and agricultural/grassland habitats further than three miles from the base of major mountain ranges and one mile from major riparian corridors – but includes everything else within occupied range. As noted, jaguars have been extensively documented in arid grasslands. Thus, while "occupied range" for jaguars suggests the Sky Island region's suitability to the species, further parsing of jaguar habitat use to only reflect mountain ranges and exclude grassland areas is not supportable.

VIII. The Center for Biological Diversity's recommendations for critical habitat designation in Arizona and New Mexico. For the purposes of identifying critical habitat for the jaguar, we have incorporated large areas identified in the map depicting the habitat according to the habitat subcommittee's criteria (Fig. 1). Because jaguars have been repeatedly observed in relatively non-rugged habitats, such as portions of the Mogollon Rim, desert grasslands, and areas of the Great Plains and southeastern woodlands, we chose not to exclude such gently-sloping terrain from our recommendation even though the Arizona and New Mexico game departments excluded some areas for that purpose. Indeed, the JCT Scientific Advisory Group recommended using a terrain ruggedness index specifically to help analyze "connection potential" between jaguar habitats.[61] To use such an index to analyze connecting habitat suggests that habitats that might otherwise be unsuitable could be used nonetheless for jaguar travel if sufficiently steep or rugged. But the state agencies used the index instead to exclude areas that would otherwise qualify as jaguar habitat, if they were insufficiently steep. This excludes areas necessary for conservation of the jaguar, and needing special management – such as relatively flat areas that jaguars traverse between mountain range in the Sky Islands. Since such habitat corridors will need to be managed to maximize jaguars' ability to safely travel through them, we included them in our critical habitat recommendation.

In adapting the map in Fig. 1 to a critical habitat recommendation, we did, however, exclude small- to medium-sized patches of habitat that were not well-connected to larger swathes of habitat. Those excluded areas include parts of the Great Plains and southern Rocky Mountains in northeastern New Mexico, and the Grand Canyon region in northern Arizona. Our ensuing map of recommended habitat for New Mexico and Arizona is Figure 5, below.

[60] U.S. Fish and Wildlife Service. 1999. Biological Opinion on USDA APHIS-Wildlife Services program effect on jaguars, p. 13.

61 Miller, B., A. Rabinowitz, and C. Lopez. 2000. Review of jaguar conservation strategy, 10/25/2000 memo to Jaguar Conservation Team habitat subcommittee.



[Figure 6.] Region recommended for critical habitat designation in Arizona and New Mexico.

The areas depicted in Figure 6 comprise approximately 27,052,000 acres in Arizona, and 26,118,000 acres in New Mexico.

In southwestern New Mexico and southeastern Arizona, the areas we recommend include such Sky Island mountain ranges as the Animas, Peloncillos, Chiricahuas, Rincons, Pajaritos and others. The Sky Islands ecosystem consists of isolated mountain ranges that have long been inhabited by jaguars. From 1996 to 2009, Macho B was known to live and roam in the Pajarito, Atascosa, Tumacacori, and Baboquivari Mountains. Other jaguars have been confirmed in 1996 in the Peloncillo Mountains, in 2006 in the Animas Mountains, and in 1986 in the Dos Cabezas and Chiricahua Mountains.

Some of the Sky Islands include extensive roadless areas, such as the 723,000 acres identified in the early 1990s as roadless in the Galiuro Mountains, and the 217,000 acres identified in the same period as roadless in the Rincon Mountains.[62] These and other sky islands which have had jaguars further back in time, along with some or all of the desert lands between

[62] Foreman, D. & H. Wolke. 1992. The big outside: a descriptive inventory of the big wilderness areas of the United States (revised edition). Harmony Books, NY, pp. 316-319.

them, were identified in the Center for Biological Diversity's map for the Jaguar Conservation Team habitat subcommittee (Figure 1), in the two state wildlife agencies' maps for the subcommittee as well (Figures 2 & 3), in the Sierra Institute Field Studies Program in Arizona report to the habitat subcommittee, in the Boydston and Lopez Gonzalez study (Figure 4), as well as the Fish and Wildlife Service's biological opinion on USDA Wildlife Services's impacts on jaguars.

Our requested critical habitat designation also includes the Gila headwaters area of west-central New Mexico and the adjoining Mogollon Rim in Arizona. The Gila headwaters and Mogollon Rim comprise a largely unbroken montane region (absent the natural fragmentation from intervening desert valley as found in the Sky Islands), including millions of acres that are roadless[63] and a variety of conifer and deciduous forest types. In New Mexico, the heart of that habitat is in the Gila National Forest, but adjoining Forest Service, BLM, Fish and Wildlife Service, state, tribal and private lands also provide important habitat and are included in Figure 4. In Arizona, the Mogollon Rim and adjoining recommended lands are owned and managed by an assortment of federal, state, tribal and private entities, as are areas that we identify and recommend for critical habitat in southeastern New Mexico.

The last known female jaguar in the U.S. was killed in 1963 in the Apache National Forest in Arizona, within this region, and jaguars may have still been breeding in the region till then or later; a young jaguar was killed in the Sky Islands two years later.[64] The Gila headwaters region includes large wilderness areas and roadless areas and provides the least fragmented landscape in the United States that jaguars could utilize. In particular, the Gila National Forest's large designated wilderness areas, such as the Gila Wilderness and Aldo Leopold Wilderness, provide remote habitat for jaguars.

These mountainous uplands also support higher prey densities than the Sky Islands region. Unlike the Sky Islands, the Gila, Mogollon Rim and southeastern New Mexico areas provide habitat not just for deer and javalina, known prey of jaguars, but also for elk which jaguars are not known to prey on but can reasonable be anticipated to do so.

Almost the entirety of our recommendations for critical habitat designation in the Gila and Mogollon Rim, and portions of southeastern New Mexico, was also identified as potential jaguar habitat by the Arizona and New Mexico wildlife agencies (see figures 2 & 3) and the Sierra Institute Field Studies Program in Arizona.

IX. Other areas that should be designated as jaguar critical habitat. Areas of southeastern New Mexico, including parts of the Lincoln National Forest, BLM lands such as Otero Mesa, and White Sands Missile Range, were also identified according to analyses for the JCT habitat subcommittee. These areas also support javalina, deer and elk, among other potential jaguar prey.

Areas in West Texas, including the canyons of the Rio Grande along the border with Mexico, Big Bend National Park, the Davis Mountains, and Guadalupe Mountains National Park, although never analyzed for their capacity to support jaguars, should also receive critical habitat designation based on the undeveloped nature of most of this landscape (including over

[63] Foreman & Wolke, pp. 307-314, 344-349.
[64] Brown, D.E. & C.A. Lopez Gonzales. 2001. Borderland tigres: jaguars de la frontera. University of Utah Press, Salt Lake City, p. 7

two million acres identified as roadless[65]), the hiding cover available to jaguars as a result of both vegetation and topography, and the high numbers of deer as well as javalina.

In southern California, critical habitat should also be delineated in national forest and BLM public lands, as well as Department of Defense lands, that include large contiguous undeveloped areas, cover for hiding, and a prey base.

X. Conclusion. Jaguars are part of the native fauna of the southern United States. Designation of their critical habitat is essential to their recovery and to conservation of their ecosystems. Like other top-predators, jaguars help control populations of their prey and keep them on the move, thereby reducing over grazing and browsing. Jaguars also provide carrion for scavenging animals, such as bears, eagles and condors. Recovery of the northernmost remaining jaguar population through expansion of its breeding component into the southwestern U.S. is possible, but only if sufficiently large areas are designated as critical habitat. Conserving this population would also serve as an critical step in eventually reversing the tide of jaguar habitat loss and recovering the species as a whole.

Thank you for your consideration.

Sincerely,

Michael J. Robinson
Conservation Advocate

[65] Foreman & Wolke, 1992, pp. 369-375.

Appendix.

From Report of the Committee on Economic Mammalogy
American Society of Mammalogists

signed by A. K. Fisher & W. B. Bell of U.S. Bureau of Biological Survey 1927

from archives of The Museum of Vertebrate Zoology, University of California at Berkeley

3

their capture. A number of wolves which cross our southern boundary from Mexico travel several hundred miles to the northward before they are finally captured. Although we may not have as positive data on the subject, the mountain lion is supposed to travel even much further during certain times of the year. It is a well-known fact, however, that the jaguar coming from Mexico sometimes reaches the northern portions of New Mexico and Arizona. During the year just past a fine male jaguar was killed some forty miles west of Prescott, Arizona. During the past two or three years at least five jaguars have been killed in Arizona. Most of these wanderers have been males, but there are some exceptions, as at least one female was killed and another is supposed to have been poisoned.

A few itinerant bounty hunters and trappers, feeling that their vicarious form of living might be interfered with, have broadcasted statements that poison operations are practically exterminating all fur-bearers. From their language one would imagine that the marten and fisher were once abundant in the open country and deserts instead of in the colder and higher regions where fir and spruce trees exist. The general public not knowing conditions, is liable to be led astray by these statements. Since the war furs have been so high that fur-bearers have been sadly reduced in numbers by trappers who are thinking only of the money which they hope to secure from the sale of furs. If they learn of a locality where marten exist, they usually stay there until it is possible to secure the last individual. After very careful inquiry by all of the predatory

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