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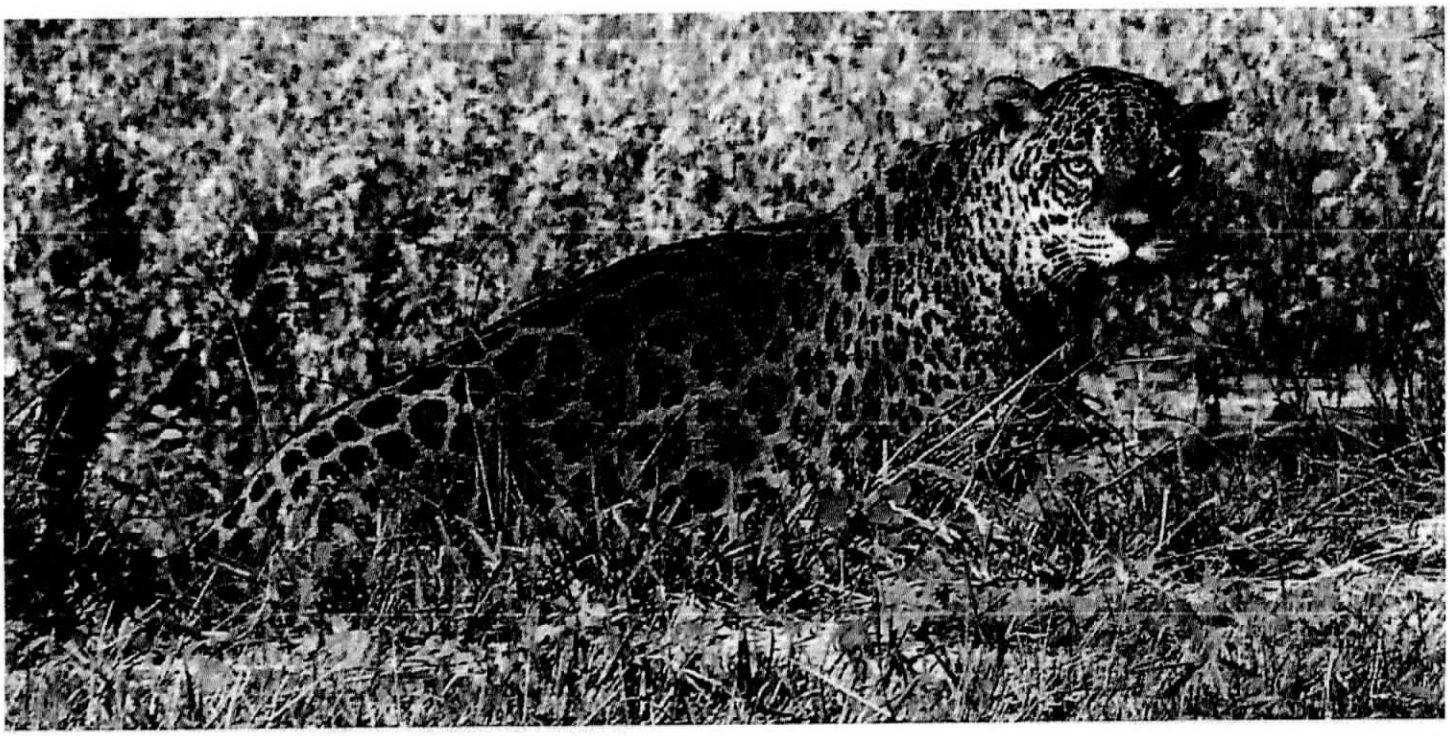
Breeding Jaguars (*Panthera onca*) extirpated in the United States, 3,800 remain in Mexico… and counting

Ron Thompson, *primeroconservation.org*, **Ivonne Cassaigne, PhD candidate, UNAM, Mexico City**



Perhaps the title of this article pales amidst announcements of global calamities such as the distress call by the Kepler spacecraft, 75 million miles away seeking new habitable planets; or the announcement that one third of our ocean's coral reefs are dead, or Mother Earth's axis wobble is shifting due to a change in weight caused by the melting and shifting of polar icecaps due to human-caused climate change. Too large to grasp? Then consider our smallest flying mammalian pollinators falling from their eastern hibernacula and dying due to white-nose syndrome.

We had hopes for a different announcement for jaguars in America, especially the U.S. After spending approximately one million USD total on a jaguar recovery team, a three-year monitoring effort in the U.S. identified a solitary male jaguar in Arizona (Culver et al. 2016). This last known jaguar in the U.S. has not been detected since October, 2015 where it had been detected regularly by trail cameras for almost 3 years (M. Culver, personal communication). Jaguars come and go in different mountain ranges, so solitary male jaguars may once again appear in the U.S., as they have in the past, on the average of every 3-5 years (Culver et al. 2016). Yet, one or two males on the landscape does not form the basis of a breeding population.

The following events in the U. S. have placed urgency on Mexico. Based on recent events in both the U. S. and Mexico, we predict that jaguars will appear in the U.S. less frequently than in the past and will have a reduced chance of survival. The following events have placed urgency on Mexico to become the leader and caretaker of the furthest northern population of jaguars in North America:

- A decision last year by the United States Fish and Wildlife Service (U.S.F.W.S.) to weaken the Endangered Species Act with a new interpretation of what constitutes an endangered species (Sanderson 2015);
- an administrative refusal to consider translocation as a viable method for jaguar recovery in the U.S.;
- new regulations by the New Mexico Department of Game and Fish (NMDGF Comission, 2016) that permits year-long trapping of puma (*Puma concolor)* on private property and seasonal trapping of puma on State Trust lands;
- unregulated continuous trapping of puma in Texas;
- and trapping by licensed trappers and Wildlife Services within designated critical jaguar habitat in Arizona.

How could this happen on "our watch"? What is causing the disappearance of North America's largest carnivore throughout its range? This article is not about what has already happened in a country that prides itself on the accomplishments of its North America Model of Wildlife Management. It is about what Mexico will have to do to keep the jaguar from appearing in an extirpation announcement of yet another one of its apex carnivores.

In Mexico, the grizzly (*Ursusarctos nelsoni)* and the Mexican wolf *(Canis lupus baileyi)* were extirpated due to livestock depredation (Brown and Murray, 1988, Valdez et al. 2006), and this is the same reason most often given today for the unlawful killing of jaguars (SEMARNAT 2006, Rosas Rosas et al. 2010). The jaguar and puma are currently protected by Mexican federal laws. The jaguar is listed as a species in "risk of extinction" (NOM-059-SEMARNAT-2010). To date, only one illegal jaguar-killing incident has been successfully

The furthest northern breeding female jaguar known (currently with young) living along the Rio Bavispe, approximately 170 km south of Douglas, Arizona (photo by GreaterGood.org in conjunction with primeroconservation.org March 2016)

prosecuted, with only an administrative sanction as punishment.

From the Mayas to the Incas to the Guaraní Indians of the Gran Chaco, jaguars are perhaps the most powerful cultural icon for wildlife and wildlands in Mexico. Today, across a broader human society, jaguars are also an emblem of power, elegance, and strength, and are used in logos for cars, sport teams and trans-national trucking companies. Beyond its cultural importance, the jaguar as a top predator plays a critical roles in maintaining ecological systems, with over 109 prey species documented in its diet (Hayward 2016). It is an umbrella species, because jaguar populations require large areas of habitat with little or no human presence, hence support an immense diversity of other wild species.

Wild jaguar populations in Mexico, like many of the country's diverse wildlife populations, stand at a crossroad. Will this powerful carnivore survive through the next decade as a functioning part of the wild ecosystems it inhabits today? Or will its future be relegated to zoos, captive breeding facilities, and a few protected areas? Jaguars are adaptable and can live in many different habitats, including thick tropical rainforests, tropical dry forests, montane forests, scrublands and semidesertic areas; their range extends through Mexico from the U.S. borderlands south to the Selva Maya on the Guatemalan border, down through Central America and as far south as Argentina. Mexico still contains several viable jaguar subpopulations, but urgent actions are needed to prevent the species' further decline and to sustain the source populations to repopulate neighboring countries to the south and north.

Jaguars face severe problems throughout their range, primarily related to direct illegal killing due to real or perceived conflicts with livestock (Hoogesteijn and Hoogesteijn 2005). Additional increasing threats in Mexico include habitat loss and fragmentation from major highway projects (Colchero et al. 2011), human population growth with subsequent settlement, and deforestation (CONANP 2009). Most recently, ranchers have been using a highly-toxic pesticide to kill predators. The poison, Furadan, is manufactured in the U.S., where its use is banned by the United States' Environmental Protection Agency. Currently distributed and sold in other countries, including Mexico, it is devastating not only for large and small predators, but to scavenger bird species as well. A second highly toxic poison, Compound 1080, is used for limited purposes in the U.S. by Federal Wildlife Services animal control personnel. Although outlawed in Mexico, it is illegally obtained and used to kill predators in northern Mexico.

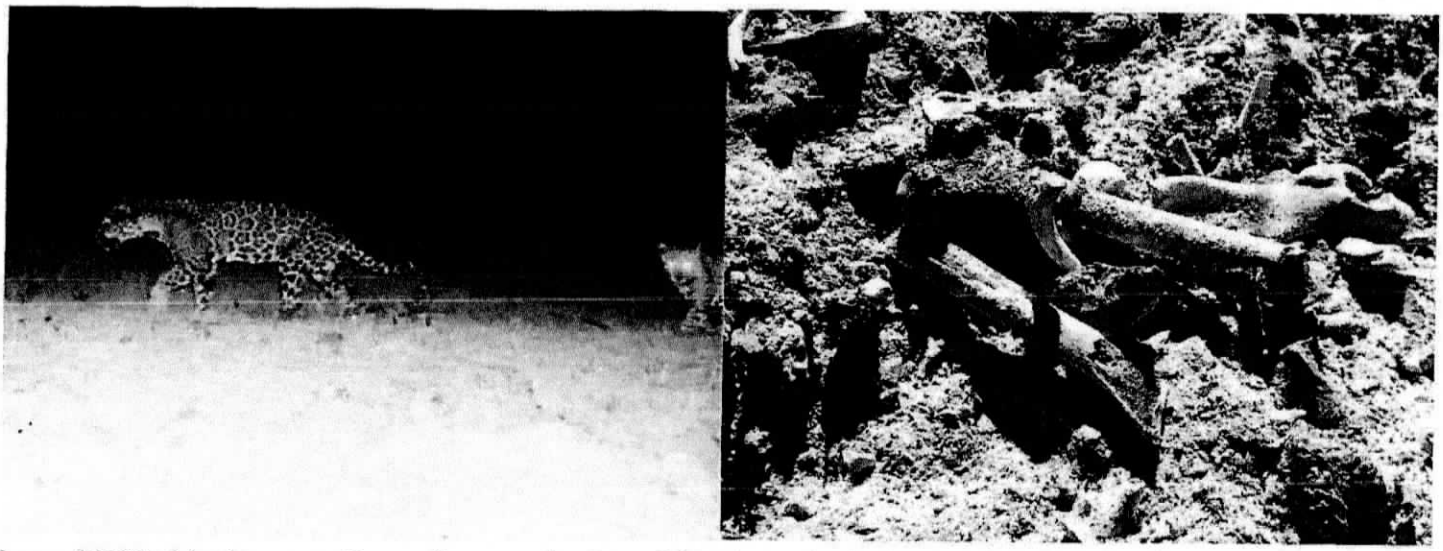
Mexico has adopted a multidimensional approach to tackle these threats. First, the Secretary of Agriculture, Cattle, Rural Development, Fish and Feeding (SAGARPA, Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación) through the National Cattle Confederation (CNG, Confederación Nacional Ganadera) has established an insurance program that pays livestock owners for all cattle, sheep and goats lost to predation by any carnivore, including feral dogs. One third the total value is paid for cattle losses and the total value for sheep and goats.

Mexico does not permit commercial fur trapping, and predator

control for depredation is highly regulated for puma and never allowed for jaguar. Mexico's wildlife law (Ley General de Vida Silvestre) prohibits infliction of pain or suffering to any wild animal. The penalty under Mexican law for the killing of a jaguar is a prison sentence for a period of up to 9 years.

Through the Commission for Natural Protected Areas (CONANP, Comision Natural de Areas Naturales Protegidas), Mexico has established "surveillance groups" from the communities that live in jaguar habitat. These collaborate to improve protection and conservation of jaguar. Additionally, there are currently two well-organized professional working groups recognized by the federal government as the leaders in jaguar conservation efforts: National Alliance for the Jaguar Conservation (Alianza Nacional para la Conservacion del Jaguar- ANCJ); and the Group of Experts in Conservation and Sustainable Management of Jaguar and other Wild Felids of Mexico (Grupo de Expertos en la Conservacion y Manejo Sustentable del Jaguar y otros Felinos Silvestres de Mexico). These organizations, which in turn include approximately 30 nonprofit organizations and academic institutions, meet regularly to address and monitor threats to jaguars and to keep both the public and governmental officials appraised of the jaguar's precarious situation. Both groups are pressing the Mexican government to ban the use of Furadan and to restrict the commercialization of many additional pesticides. They are supporting community surveillance groups and generating most of the research needed to identify biological corridors and protected areas for jaguar conservation. Additionally, the community groups are looking to collaborate with SAGARPA to establish better livestock management programs while improving jaguar monitoring methods.

The Mexican federal government through its CONABIO (National Commission for the Use and Study of Biodiversity) defines Terrestrial Priority Regions for Conservation. In northern Sonora designation of the Bavispe-El Tigre priority area, being the closest to the U.S. – Mexico international border, allows additional funds to be used, when made available, for jaguar conservation. In 2002 this area was identified by the international group of jaguar experts as Jaguar Conservation Unit # 100 (JCU100), with a "medium probability" of long-term survival of jaguars that will increase to a designation of "high" if conservation actions are inacted. The JCU100 incompasses 10,470 km^2. Currently there is a local effort to increase the survival probability of jaguars to "high" by restoring peccary (*Peccary tajacu)* as an important prey species. This conservation model incorporates written contracts with ranchers who promise to not kill jaguars, puma, or peccaries in exchange for full-value depredation payments upon livestock depredation verified by a certified depredation field investigator; translocations of peccaries to areas with livestock depredation problems; synchronization of calving by qualified personnel; and movement of livestock and and maintenance of pastures away from seasonal habitats for jaguar (e.g., riparian areas in the dry season).



Jaguar SONF1 (also known as Corazon), was at the time of this photo, the furthest northern breeding female known in Mexico, with the first-ever kitten photographed in Sonora with a trail camera (photo credit Jesus Moreno Martinez and Manuel Galaz, Primero Conservation.org). The second photo shows remains of jaguar SONF1 at the end of a two year diet study. She was presumably poisoned using a peccary carcass. Peccaries had been translocated to increase native prey and reduce livestock conflicts.

Mexico's National Jaguar Survey

From 2008 to 2010 a country-wide jaguar survey using camera traps resulted in a jaguar populaton estimate of 3,800 jaguars (Ceballos 2011). The survey's methodology, as described in a technical report (Ceballos 2012) consisted of 18 survey areas distributed across areas known to be inhabited by jaguars. Each survey area had a minimum area of 81 km^2, and was divided into nine sampling cells of 9 km^2 each. Each cell was divided into an additional nine cells of 1 km^2 each, where three camera trap stations were set. Two stations consisted of one camera each and a third station consisted of two cameras, with a separation of one to three km between each camera. In total, an array of 36 camera traps was set for a duration of 30 consecutive days. A second similar survey is currently under way covering the same areas as previously surveyed for a comparative analysis.

A Trend From a Smaller Scale Camera Survey

A camera study was implemented in April 2009 east of the junction of the Bavispe, Arros and Yaqui rivers in Sonora Mexico, approximately 180 km south of the international border. This study is ongoing and

supported by Primero Conservation and GreaterGood.org. Between April 2009 and March 2014, 52 camera sites covering an area of 441 km² have been monitored for 1785 calendar days or 24,774 camera trap days. The cameras recorded 33 species of mammals and captured 308 pictures of jaguars. Twenty-three individual jaguars were identified, using right and left side pictures. Sexes and ages were 11 males, 12 females and 2 kittens. This area is probably the northern-most breeding jaguar population in North America. Jaguar detections over the five-year period declined from eight to ten individuals detected between April 2009 and June 2011, to a low of two individuals from the end of 2013 through March 2014. During this period six jaguars, including two marked study animals, were verified by field personnel to have been killed for livestock conflicts. Camera effort by month was consistent throughout the duration of the study, averaging 444 camera trap days. During the recent nationwide survey no jaguars were detected in areas of Sonora where jaguars were detected just a few years earlier (Cassaigne, personal observation). We can only hope the trend is not the same throughout the rest of Mexico.

Current Threats to Mexico's Jaguars

Despite having good federal laws and programs, jaguars are still being killed for livestock conflicts, illegal hunting and commercialization of their bones and / or skin. There is clearly a lack of enforcement of the existing laws. To date, no one has been imprisoned for killing a jaguar. This, combined with the lack of effective communication between federal national department secretaries, can result in separately-implemented programs that are less beneficial to wildlife than they would be if everyone worked together to achieve desired results. There is no real economic incentive and support from the government for livestock owners to improve their cattle management practices beyond structural range improvements. Synchronizing breeding alone would greatly increase calf production and reduce jaguar conflicts.

New highways are being built to support tourism and commerce. Despite strict requirements for environmental impact analyses prior to road construction, wildlife movements across habitat patches are rarely considered, and in very few occasions have wildlife passes been constructed. Finally, a future major threat for jaguars, despite climate change and international agreements, is oil, gas and mineral exploration and extractions, which have high priority within Mexico's current political and economical agenda.

Future Recommendations and Actions

- Better survey data and methods. As jaguar conservationists we can do more with less time and funds, if we work together for the good of the species on a larger scale. Recent advances in research are not being applied to carnivores with continent-size ranges. We recommend that methodologies be investigated similar to that initiated by the Jane Goodall Institute, in partnership with the University of Maryland (and funded by NASA), that annually maps all chimp habitats in Africa using LandSat data that compliments data platforms like Global Forest Watch. In order for a similar effort be initiated throughout jaguar habitats, jaguar researchers rangewide will need to place their egos aside and put their data "on the table" and collaborate in a similar protected data base.
- Improved training, funding and support for those involved in the enforcement of Mexico's environmental crime regulations. This includes a nationwide toll free number and rapid response investigative teams to react to reports of illegal poisons, killing of jaguars, and commercialization of jaguar parts. In an on-going poaching case of a jaguar, federal investigators travelled from Mexico City only to arrive totally unprepared for the need for travel by foot or horseback far to the site of a jaguar mortality. Prosecutorial support for wildlife crimes with specially trained lawyers with a passion for environmental crimes should be appointed in order to expidite prosecution of defendants. An education program is needed for judges concerning wildlife values and the values Mexican citizens have placed on the jaguar as a threatened iconic Mexican species.
- Bring all federal and state agencies that are responsible for wildlife conservation and livestock management together into a collaborative, synergistic force that supports payments not only for depredation losses to predators, but also creates initiatives requiring all livestock owners receiving governmental funds to improve their livestock management. This should include synchronized breeding so that calving peaks at prey birth pulses, rest rotation grazing systems that keep calves away from "forest edges", structural range improvements (water, fences, corrals) that result in pasturage outside of seasonally high predator use areas such as riparian areas during dry periods.
- Improve management of preferred prey for jaguars, including translocations of peccaries from certified wildlife management areas (UMAs) as alternative prey on ranches with consistent livestock depredation by jaguars.
- Develop partnerships with nonprofits that support jaguar habitat protection and use of innovative methods such as payments for jaguar presence (photos), conditioned taste aversions, predator unfriendly water developments, intermittent lights, herding, flagery, electric fencing, and night paddocks, especially for sheep and goats. Free ranging feral and domestic dogs can be a jaguar attractant in communities adjacent to tropical forests and should be vaccinated and controlled, especially at night.
- Increase natural protected areas and promote other sources of income than cattle.
- Identify and designate biological corridors to be protected from fragmentation by highways.
- Increase economical compensation for loss of cattle to cover the full value of a cow lost to predation.

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