The jaguar in Mexico

Gerardo Ceballos, Heliot Zarza, Greta Cerecedo-Palacios

Nature... will only be saved if man loves it,
simply because it is beautiful...
For that, too, is an integral part
of the human soul.

Before Nature Dies
Jean Dorst


SW

The Jaguar: Lord of Mexico's Tropical Forests

A while back, Dr. Gerardo Ceballos, an ecologist and conservation biologist, wrote: "I am on a field trip to study the ecology and conservation needs of jaguars in the tropical forests of southern Mexico. The sky is clear and winter nights are astonishingly cold. Still exhausted from previous weeks of work, I awoke early this day to a damp cold and near total darkness. My eyes slowly adjusted to strange figures in the early twilight, and a symphony of frog and cricket sounds, and the endless hooting of a barn owl filled the air."

"Our camp is located near a water source, deep within the heart of the Calakmul Biosphere Reserve, one of the very last refuges for many wild animals and plants of tropical Mexico. In 1989, Mexico´s government decreed the creation of this 723,000 hectare reserve." In 2014, UNESCO declared the reserve as a mixed biological and cultural World Heritage Site, a designation for places on Earth that have outstanding cultural or natural universal value to humanity. This reserve supports the largest jaguar population in Mexico, and as such, it is a conservation stronghold for this endangered species. "I left our tent and

gazed into the clear night sky where countless stars shined, a scene as old as the universe itself. The first rays of the rising sun announces the beginning of a new day and the forest slowly wakes up. We had let the dogs out, and their sudden outburst of barking was a sure sign they found a jaguar´s trail and were running wildly after the elusive animal. We have been walking for more than three fatiguing hours and I can feel my heart pounding inside my chest. Just as we begin to think we have lost the dogs, we hear them howling again in the distance. They have stopped the chase and the jaguar has probably climbed up a tree to escape from the dogs! As we approach the area where the dogs surround an immense mahogany tree, we see a large jaguar crouched in the lower branches. We shoot a tranquilizer dart, and in a few minutes the jaguar is on the ground. We take its body measurements and weight, draw blood samples, determine its gender and assess its health."

"As he lies on the ground, the deep and mysterious eyes of the jaguar glare at us and we silently admire this impressive animal. While he slowly recovers from the effects of the tranquilizer, he listens carefully, sniffs and watches, trying to fathom what is going on. Perhaps we are the first humans it has ever laid eyes upon. The dogs have gone by now, and we hear their howling in the distance. The jaguar, totally awake now, suddenly jumps up a tree trunk; its movements are silent even though the ground is completely covered in dry leaves. He gives us a final glance before his majestic disappearance into the forest. This is a scene we will never forget. As I reflect on this incredible, almost magical experience, I wonder what will become of it; I cannot imagine a world without jaguars and so many other endangered species. Their survival depends on us, and paradoxically, our own survival is possible only with theirs."

A jaguar's powerful bite, aimed at the prey's head, helps ensure a successful hunt. Jaguar cubs venture out of the den when they are six months old and the color and patterning of their fur provides a perfect camouflage.


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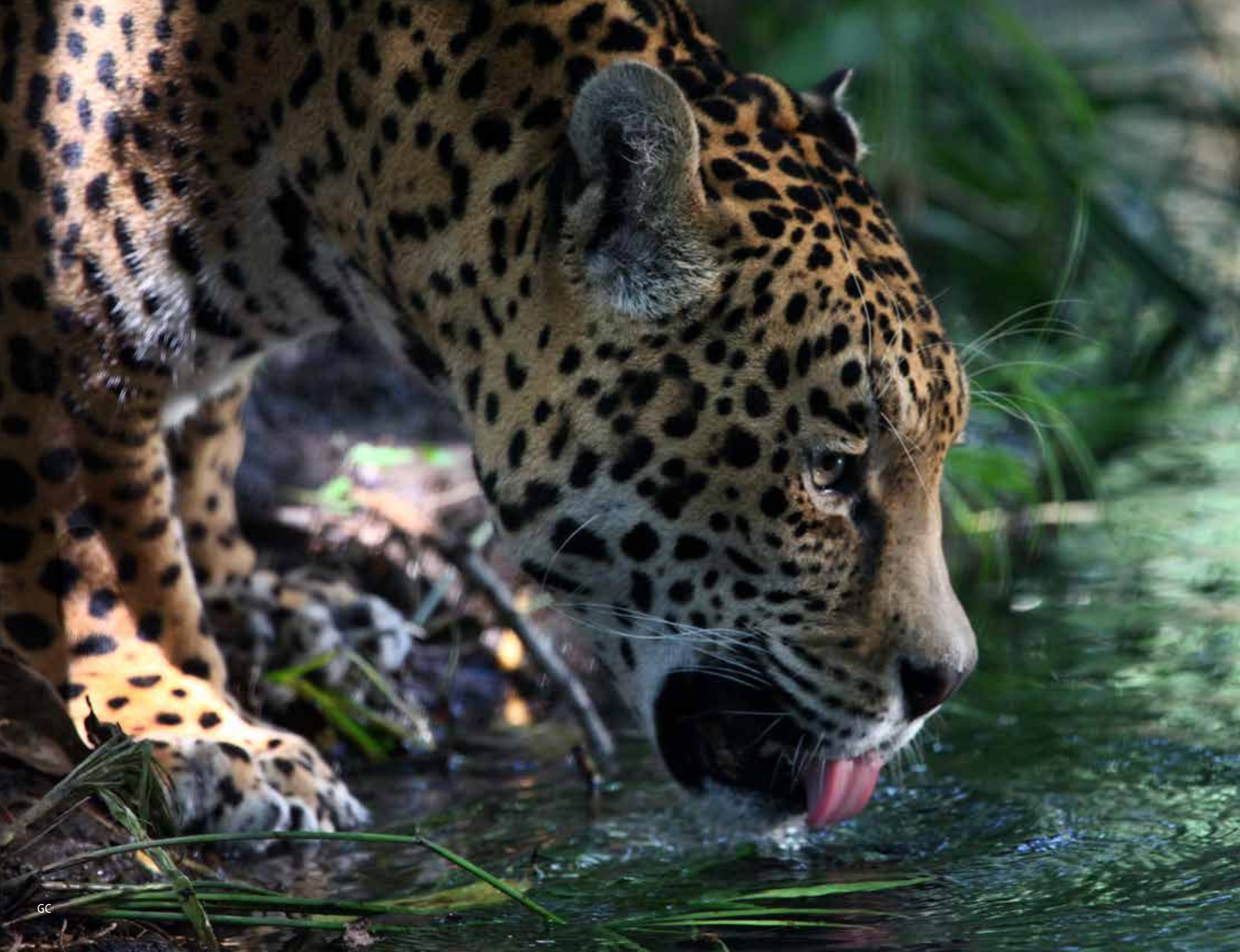
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An Endangered Species

Up to the beginning of the 20th century, jaguars roamed over a vast territory of tropical and subtropical regions of North and South America, from the arid scrublands of Arizona and New Mexico in southwestern United States of America to the Misiones tropical forests in northern Argentina. Currently its geographic range has contracted primarily because of illegal hunting and the conversion of millions of hectares of tropical ecosystems to agricultural lands, grasslands, urban areas, and rural communities. Vast areas of tropical forests have been severely altered in the last three decades.

It is estimated that there were more than 300,000 jaguars in the Americas when the Spaniards first arrived in the western hemisphere at the start of the 16th century. Since that time, the jaguar population and range has changed dramatically. Jaguars are now nearly extinct in the USA, El Salvador and Uruguay, and in Central America only a few remnant populations exist in Panama, Costa Rica, and in the Misquitos region of Honduras. The total jaguar population is now estimated to be around 50,000 individuals, and most are located in Brazil.

In Mexico the main causes of the declining jaguar populations are attributed to habitat loss and fragmentation, poaching of jaguars and its prey, human-jaguar conflicts and disease transmission by livestock and other domestic animals.

Jaguars in Mexico are threatened with extinction, and the long-term survival of this magnificent animal hinges upon our response to the many unique conservation challenges they face. This pamphlet provides a brief history of the efforts of the National Alliance for Jaguar Conservation, a group of institutions and individuals crusading for jaguar conservation.


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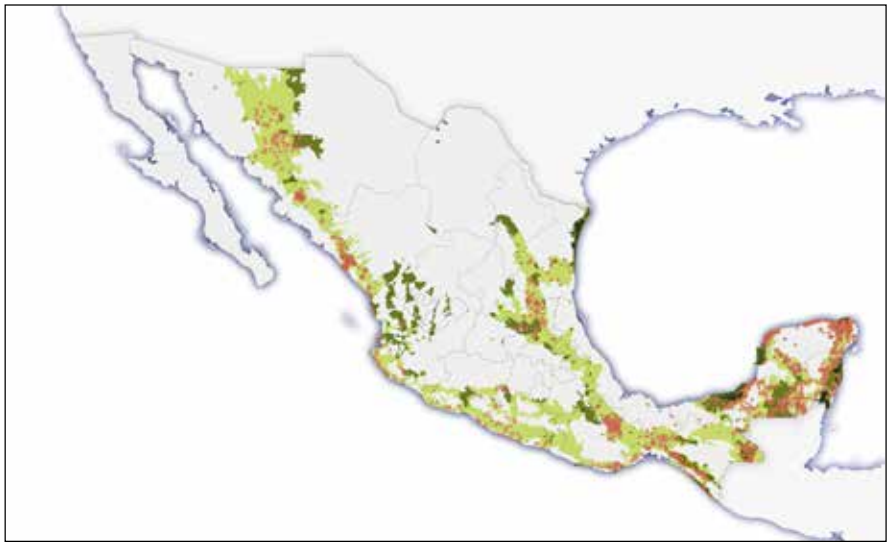
The National Jaguar Conservation Strategy



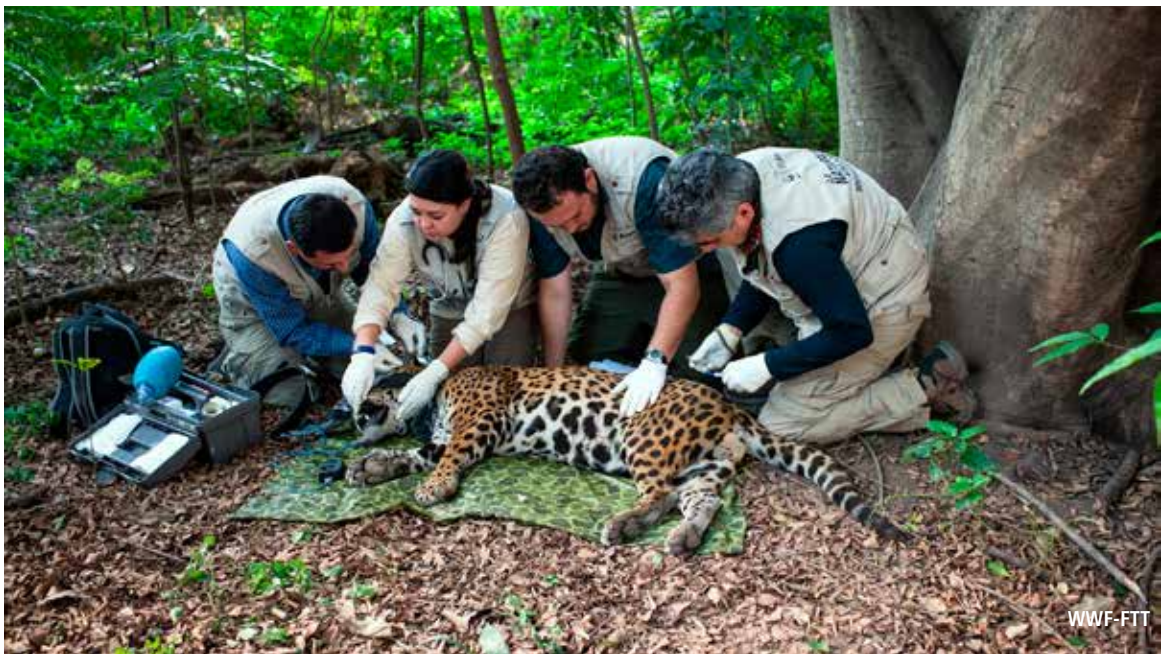
Each component of the strategy discusses in detail the main problems related to jaguar conservation and proposes solutions. For example, the component of priority areas and biological corridors has identified more than 2.5 million hectares of new protected areas and the biological corridors to maintain the connectivity along the jaguar's geographic range.

Protected areas
Biological corridors
Jaguar records

Jaguars in Mexico are threatened with extinction, and their long- term survival hinges upon our response to the many conservation challenges they face. The National Jaguar Conservation Strategy is the roadmap for short, mid and long-term goals and actions to promote conservation of the jaguar and its habitat in Mexico. It combines the work of the National Alliance for Jaguar Conservation (ANCJ), an NGO devoted to the conservation the jaguar and the biodiversity, and the National Commission for Natural Protected Areas (Conanp) of the Mexican Environment and Natural Resources Secretariat (Semarnat). It was established with the expertise of specialists in many diverse areas such as biology, ecology, conservation, economics, and humanities. The strategy identifies multiple government agencies, such as Semarnat, the Secretariat of Agriculture (Sagarpa), the Secretariat of Communications and Transportation (SCT), and the Secretariat of Tourism (Sectur), the Conanp, the National Forestry Commission (Conafor), and the Federal Attorney for Environmental Protection (Profepa) that have to coordinate their activities in order to save the jaguar from extinction.
The Strategy includes nine strategic components:

1. Priority areas and biological corridors
2. Jaguar and prey monitoring
3. Human-jaguar conflict
4. Protocol of jaguar attention
5. Legal reinforcement
6. Highway and road infrastructure
7. Environmental education
8. International cooperation
9. Community management

The jaguar's study area in Calakmul, southern Quintana Roo state encompasses the most extensive tropical forest north of the Orinoco River. In this jungle there are more than 600 jaguars such as the one been studied below.



Jaguar Ecology and Conservation: The Institute of Ecology Project

In our lab at the Institute of Ecology of the National Autonomous University of Mexico (UNAM) we began in 1997 a long-term project entitled "Jaguar Ecology and Conservation in the Mayan Forest". We centered our study in the Calakmul Biosphere Reserve and its buffer zone in southern Campeche. That region in the Yucatan Peninsula maintains the largest tropical forests in Mesoamerica. Our objective has been to generate solid scientific knowledge on the ecology and conservation of jaguars, its prey and its habitat, and to develop a long-term conservation strategy. Our study involves monitoring of jaguars and its prey using telemetry collars and camera traps. We have been very successful having 40 jaguars with tracking collars and thousands of photos of jaguars and its prey. Comparing data from the Biosphere Reserve and the adjacent forestry concessions has allowed us to understand some of the impacts of human activities on jaguars.

Now we know that the jaguar density in the region is, on average, 6 individuals per square kilometer, and that the population in the Calakmul region is around 600 animals. Their activity area is up to 90 and 60 square kilometers for males and females, respectively. We also know, among many other things, their habitat and prey preferences, activity patterns, and information such as the impacts of roads, urbanization, hunting, and cattle-conflict on jaguars.

From our regional study, we were inspired to move to a national scaled conservation program. As part of this program, since 2005, we have organized 11 annual symposia entitled "The Mexican Jaguar in the 21st Century". We have also carried out a very ambitious project: the first National Census of Jaguars and its prey (Cenjaguar) between 2009 and 2011. This has been the greatest worldwide effort ever made to determine the jaguar population size and its conservation status in a whole country. The information generated by the Cenjaguar was very interesting and important. We estimated the jaguar population in Mexico and the critical sites for its conservation. The Cenjaguar has led us to establish a National Jaguar Conservation Strategy with Conanp and Semarnat.

Similar to fingerprints, the skin pattern of each jaguar is unique and its used to identify individuals. Jaguars can be captured and tranquilized to obtain information about their health and body characteristics such as weight, size and sex. Tranquilized jaguars may also be fitted with a tracking collar that provides satellite information on its location and activity patterns.

The National Jaguar Census

Current jaguar distribution and priority regions for its conservation.

The jaguar population in Mexico was estimated at about 4,000 individuals in a very comprehensive national census carried out between 2009 and 2011. The tropical forests of the southern Pacific and the Yucatan Peninsula region have the largest jaguar populations. This is the only census that has been carried out at a national level in any country. More than fifty experts from the academia, the social organizations, the federal government and the private sector were involved in planning the project. The census was implemented in fifteen Mexican states and to date it is the largest global effort to evaluate the condition of jaguar populations in a country. This extraordinary accomplishment places Mexico as a conservation leader.

The census also showed that jaguars are still found throughout most of its historical geographic range. In terms of the vegetation types and biogeographic affinity, the following five priority conservation regions were identified:

- Northern Pacific region (Sonora and Sinaloa)
- Central Pacific region (Nayarit, Jalisco, Colima, Michoacan, State of Mexico and Morelos)
- Southern Pacific region (Guerrero, Oaxaca, Chiapas and Tabasco)
- Yucatan Peninsula region (Campeche, Quintana Roo and Yucatan)
- Northeastern and central region (Nuevo Leon, Tamaulipas, San Luis Potosi, Queretaro, Hidalgo and Puebla).

Jaguars are umbrella species, and protecting them enhances the potential conservation of thousands of other species, both plants and animals. Protecting and maintaining the connectivity along those regions is fundamental for the conservation of jaguars and thousands of other species in Mexico.

Jaguar biological data

Sexual maturity: 2-3 years
Reproductive season: December to January
Gestation: 100 days
Litter size: 1-4, average 2
Lifespan: 10 years in the wild, up to 20 years in captivity

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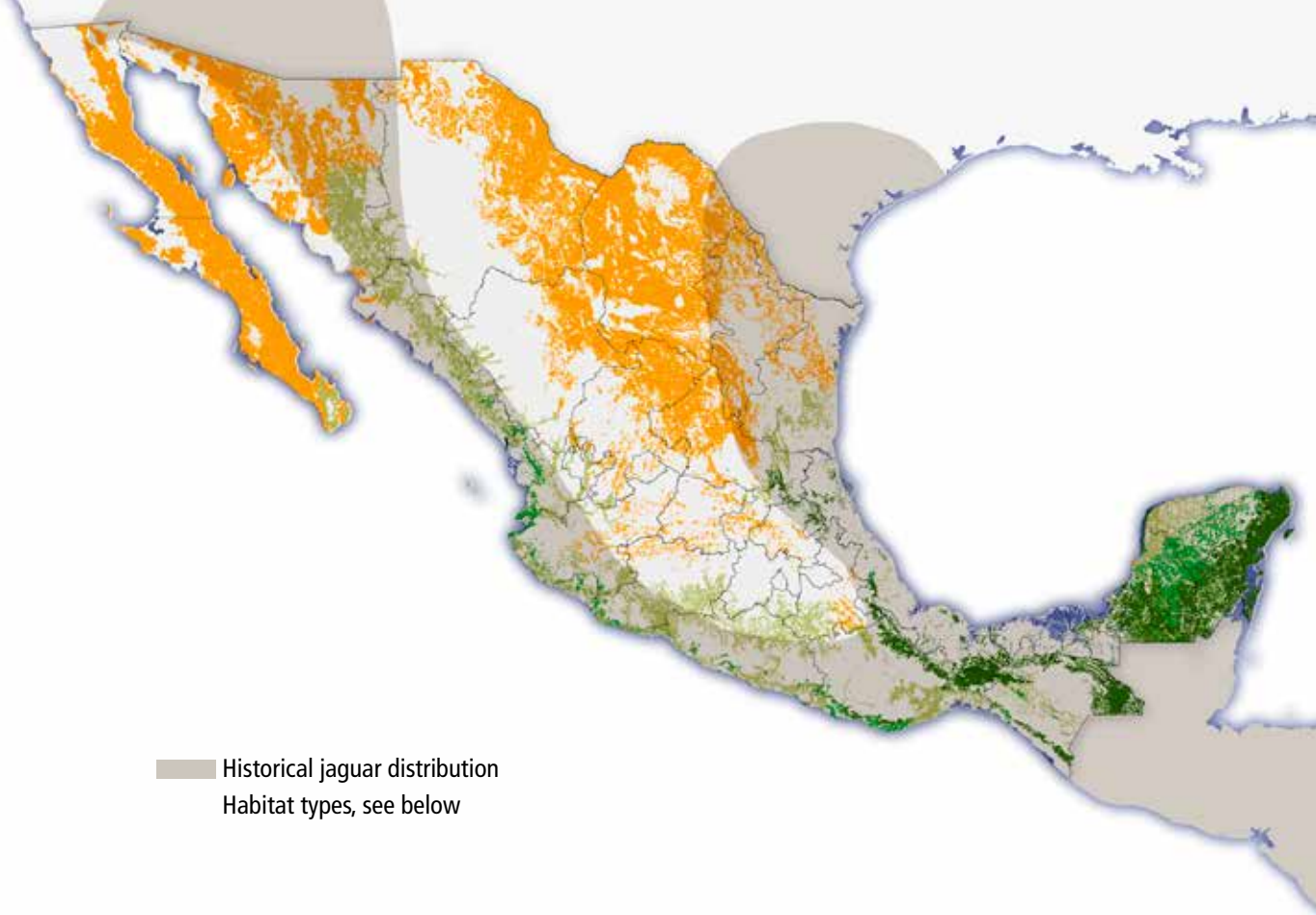
Tropical rainforest

HZ

Arid shrublands

Distribution

Jaguars can inhabit very diverse environments, from the semi-arid regions of southwestern USA to the tropical forests of northern Argentina, and it can be found at altitudes from sea level up to 2,000 meters. In Mexico, they originally inhabited tropical and subtropical regions, from Sonora and Tamaulipas, along the lowlands of the Pacific and the Gulf of Mexico down the Yucatan Peninsula and Chiapas. More than 40% of their original range has been lost, and much of the remaining area is fragmented. The loss of suitable habitat has pushed the jaguar's population to the most isolated and impenetrable areas in the country, such as Los Chimalapas (Oaxaca), the Lacandon Forest (Chiapas) and Calakmul (Campeche and Quintana Roo).



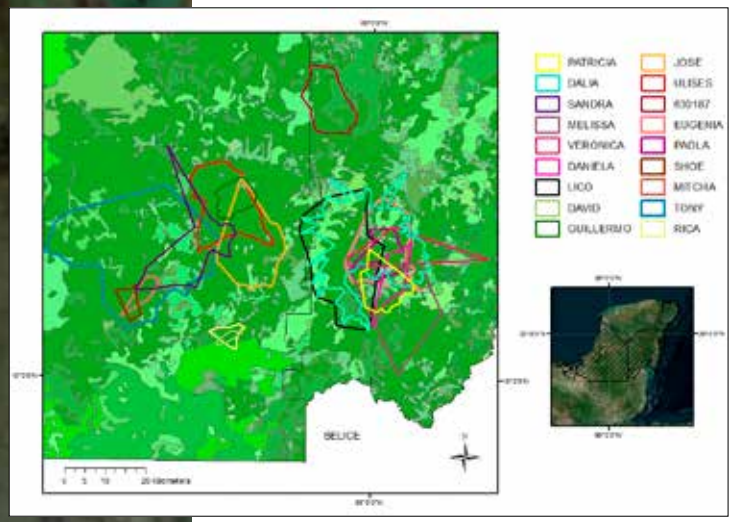
Tropical deciduous forest

Tropical evergreen forest

Wetlands

Activity Patterns

Jaguars are difficult to locate in the wild because they are crepuscular and nocturnal. To study their habits, we have placed tracking and satellite GPS collars in more than 20 jaguars. GPS technology has provided information about the movement patterns of individual jaguars. We know now that a jaguar can move up to 20 km in one night in search for food and that males and females have different movement patterns. In the Calakmul region in southern Campeche and Quintana Roo, individual male jaguars may range over areas larger than 600 square kilometers in a year, while females use smaller areas, up to 160 square kilometers. However, jaguars do not use the entire area throughout the year.



Activity patterns of seven males and 11 females in the tropical forest of the Calakmul region in southern Mexico.

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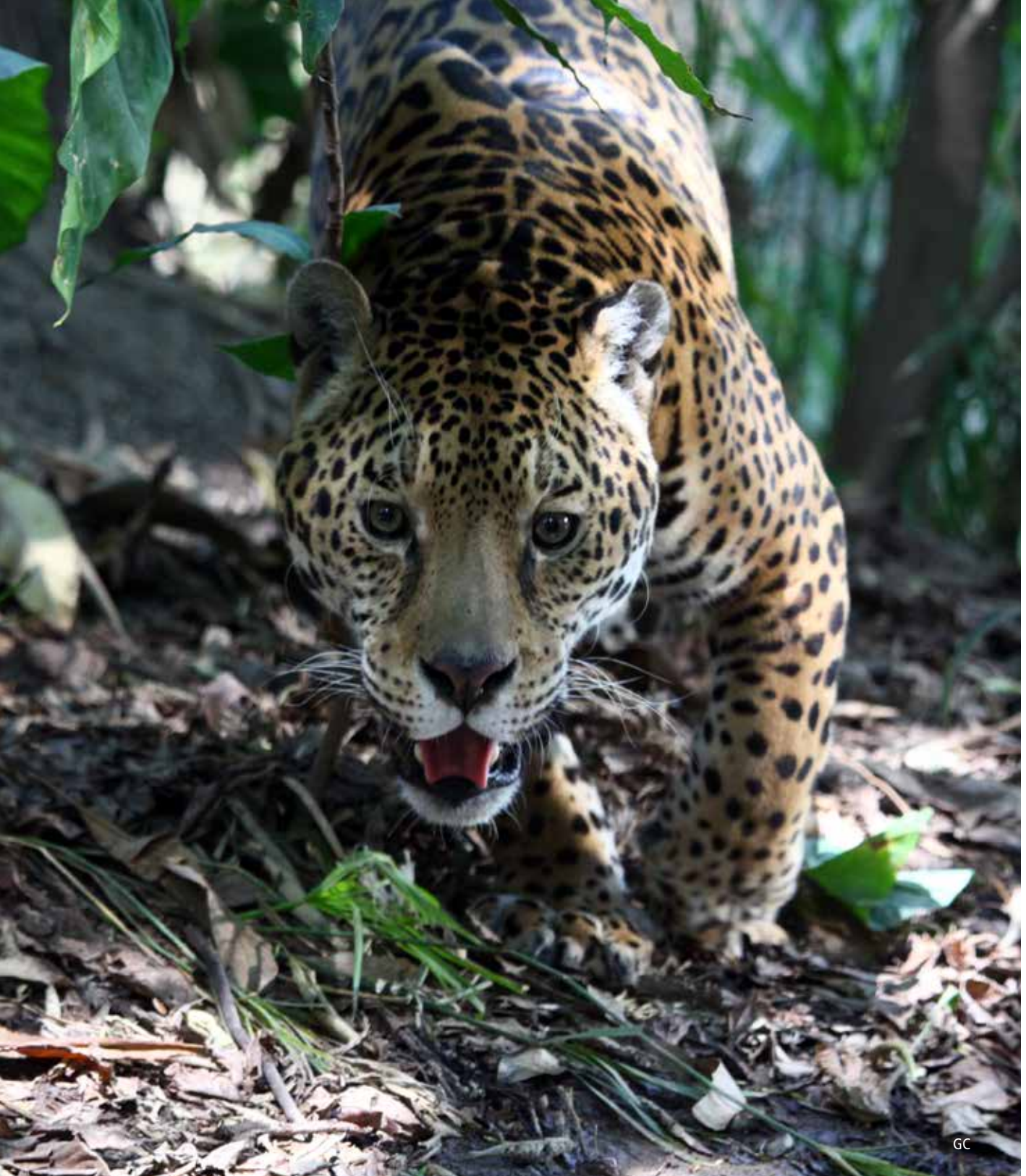
Some of the jaguar's prey species, from top to bottom and left to right: Mexican Black Agouti (*Dasyprocta mexicana*), White-lipped Peccary (*Tayassu tajacu*), Jaguar pulling its prey, Great Curassow (*Crax rubra*), Baird's Tapir (*Tapirus bairdii*).



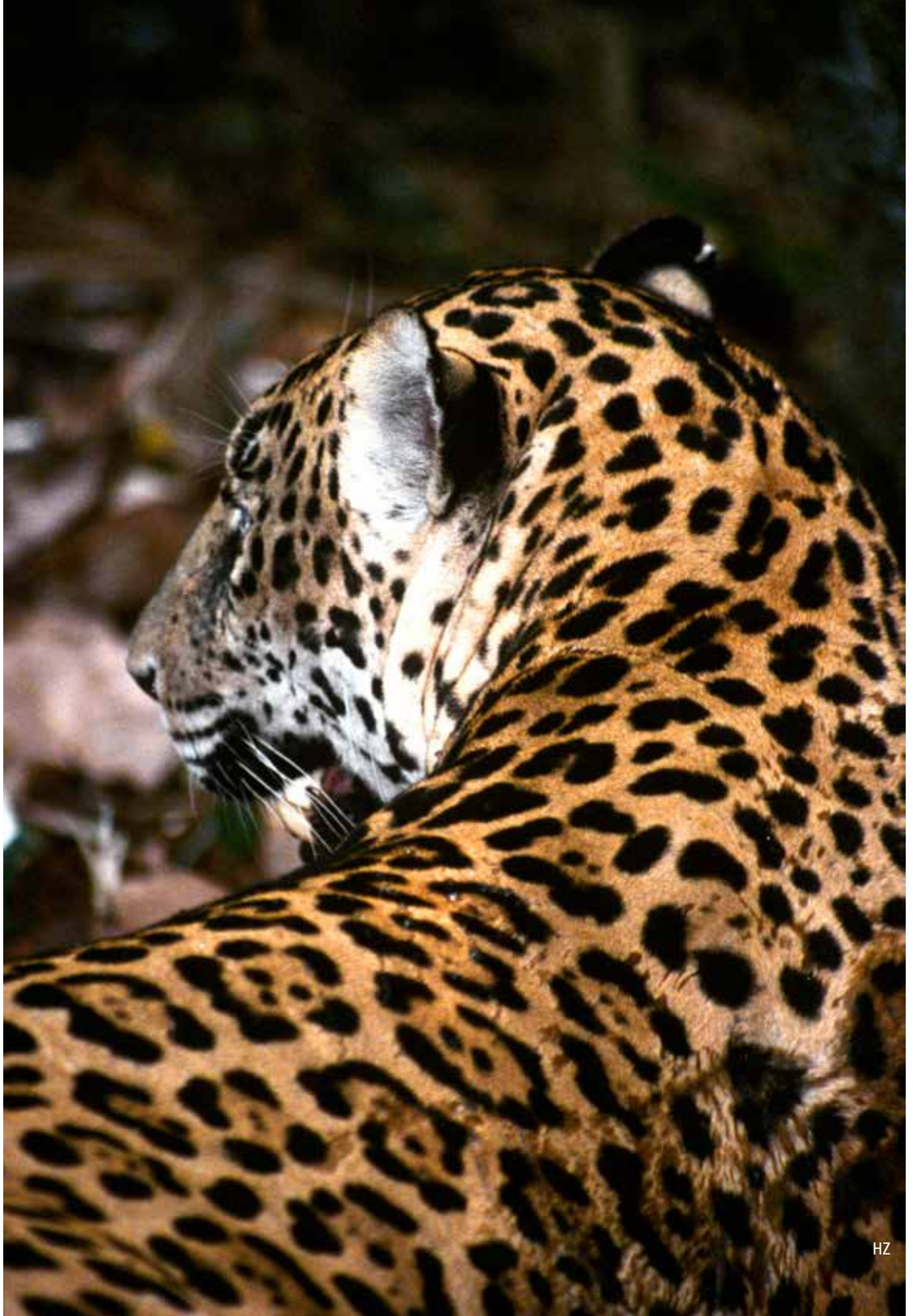
Prey

Jaguars are the most formidable predators of the American tropics, feeding on more than 22 species of vertebrates including mammals, birds, reptiles, and fishes. The jaguar's main prey species are determined by their availability which depends on environmental and geographic factors. Mammals comprise more than 70% of the prey species, ranging in size from opossums to deers. The most important prey species are the Collared and White-lipped Peccary (*Tayassu tajacu* and *T. pecari*), White- tailed Deer (*Odocoileus virginianus*), Red and Brown Brocked Deer (*Mazama pandora* and *M. temama*), White- nosed Coati (*Nasua narica*), Central American Agouti (*Dasyprocta punctata*) and the Nine-banded Armadillo (*Dasypus novemcinctus*).

Silently and patiently a jaguar stalks and prepares the ambush, ready to pounce on its prey.

Our conservation program includes collaborative efforts generated by a diverse group of specialists studying jaguars in the wild using camera traps and tracking collars and working with the local community.

Jaguar conservation depends on the coordinated efforts between society, the academia, the private sector and the federal government.

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Intentional fires are frequent in the forests to clear areas for agriculture and livestock production and road construction. These fires pose physical harm to the jaguars destroying their populations and their habitat.

Threats

Aldo Starker Leopold (son of the famed conservationist Aldo Leopold) noted in his book on Mexican wildlife (1959) "Jaguar populations have shrunk in the last 50 years in most of their range … as a result of continuous persecution, jaguars have become scarce in the tropical areas devoted to agriculture." The near sharp decline in jaguar populations threatens the survival of the species.

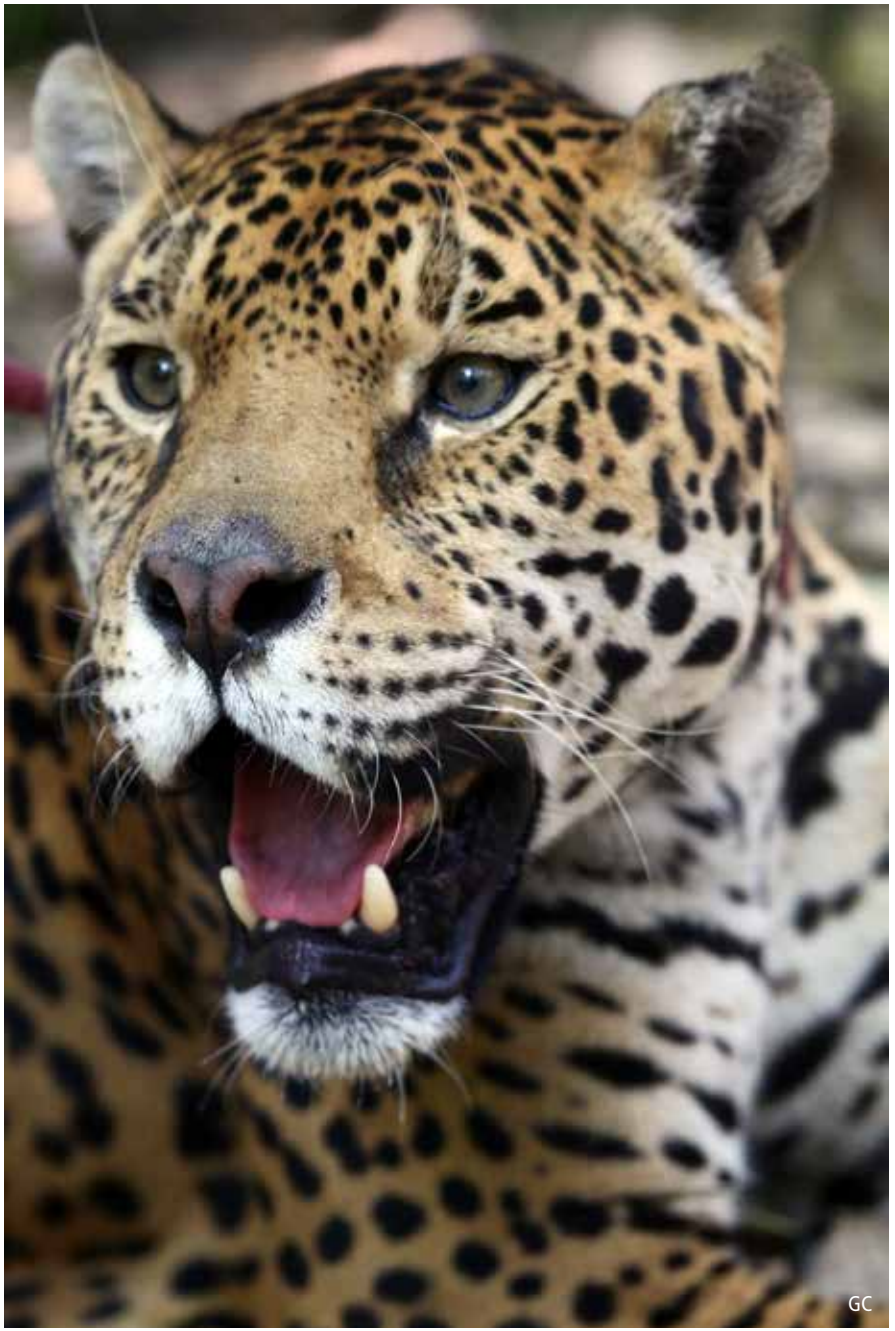
Main threats to jaguar populations are:

- Habitat loss and fragmentation
- Agriculture and livestock activities
- Decline in abundance of prey species
- Diseases from domestic animals

Habitat loss and fragmentation are primarily caused by the expansion of the agricultural and livestock frontier, forests exploitation, and road infrastructure. Accelerated cattle production increases the probability of disease outbreak and cattle predation. This may result in an increase in jaguar poaching by ranchers in an attempt to protect their livestock. Additionally, human encroachment and easier access to the jaguar's habitat facilitates poaching. Every year dozens of jaguars are still illegally killed in Mexico.

The future of jaguars is our responsibility. Strategies for their conservation require addressing main threats from an ecological, social and economic perspective. The fate of jaguars in Mexico requires sound and science-based strategies, as well as the willingness of political leaders and wildlife managers to implement those strategies, and the involvement of local communities that own the lands where jaguars are found.


ProCAT



Agriculture and Livestock Production

In the early 1900s the tropical forests of Mexico were largely continuous from southern Tamaulipas to the Yucatan Peninsula in the Gulf of Mexico and from the state of Sonora to Chiapas in the Pacific. However, the rapid expansion of agriculture and livestock production, wood extraction, industrial and urban development in the 20th century significantly affected these forests. The colonization of "unproductive" tropical forests intensified in the 1970's. By the end of the century, millions of hectares previously covered by tropical forests had been converted into crop or grazing land. For example, more than 20 million hectares of low tropical rainforests along the Gulf of Mexico, from San Luis Potosi to Chiapas, have been converted. Today, less than one million hectares of such diverse ecosystems remain; most of them in the Lacandon region of Chiapas.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Livestock-Jaguar Conflict

Cattle-jaguar contact has increased as the natural landscape is converted into grazing areas. Jaguars, facing prey scarcity, move to new areas in search of food, which occasionally results in cattle predation. Concerned about the potential loss of livestock, ranchers consider jaguars as a threat to their livelihood. As a result, they kill jaguars when possible. To reduce jaguar losses from this conflict it is crucial to develop acceptable livestock management practices compatible with jaguar conservation. Some suggestions to address this issue are:

- Synchronize calving to a given season and separate calving females into secure areas.
- Keep calves, heifers and steers away from pen borders; cattle should be in a rotating grazing system.
- Develop a national cattle insurance program to compensate ranchers for losses due to jaguar predation.
- Protect prey species from poaching.

The importance of the jaguar for pre-Hispanic cultures was depicted on paintings and sculptures in archeological areas of diverse cultures. Jaguars are still a fundamental element in the arts, oral and written narrative as well as in local festivities with symbolic elements associated with the mighty feline.

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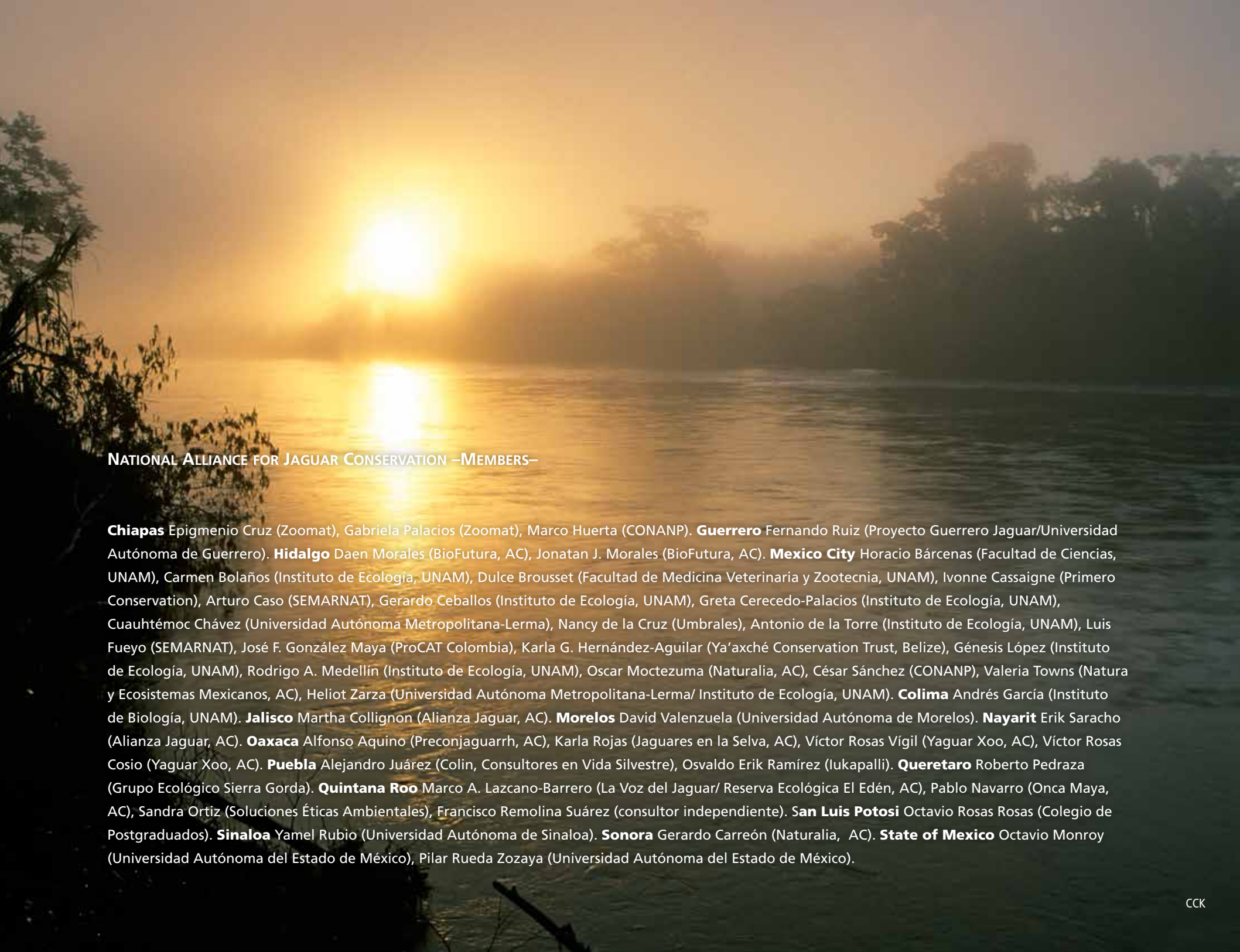
Cultural Significance

The jaguar was one of the most frequently used, important and revered symbols in pre-Columbian mythology. Its image, used in central Mexico even before the jaguar expanded its range into that area, is portrayed in many types of artistic works such as paintings, sculptures, and codex. The jaguar's image has endured for millennia, and it is known by different names depending on the native language: ocelotl in Nahuatl (Uto-Aztecan language); balam in Mayan; and jaguar or tigre in Spanish. Spaniards arriving in the Americas named the jaguar "tigre" (tiger), a name that is still used in the popular culture today. The jaguar's image possesses different meanings depending on the culture: bravery and power, the night and the underworld, fertility and even death. To the Olmecs (ancient Pre-Columbian civilization), the jaguar played such a quintessential role in their lore that they were called "Jaguar people". Among pre-Hispanic cultures, the union between humans and animals symbolized the commingling of physical characteristics with supernatural attributes. Jaguar traits were common among mighty gods, governors, priests, warriors or brave hunters. Additionally, brave warriors wore the emblematic and colorful jaguar hide, a privilege only shared with kings of old dynasties.

Mexico is at a crucial and historic time for jaguar conservation. We have robust scientific data, technological capacities, and blueprints for effective jaguar conservation strategies. We can try to move to a sustainable development that protects the jaguar and the vast biodiversity that is a hallmark of Mexico while simultaneously improving the quality of life of its citizens. Alternatively, we can choose to be passive actors, merely observing how species disappear and ecological services and processes vanish. If we choose this latter path, the jaguar, "the lord of the jungle", will stop roaring and become a silent echo of a glorious past.



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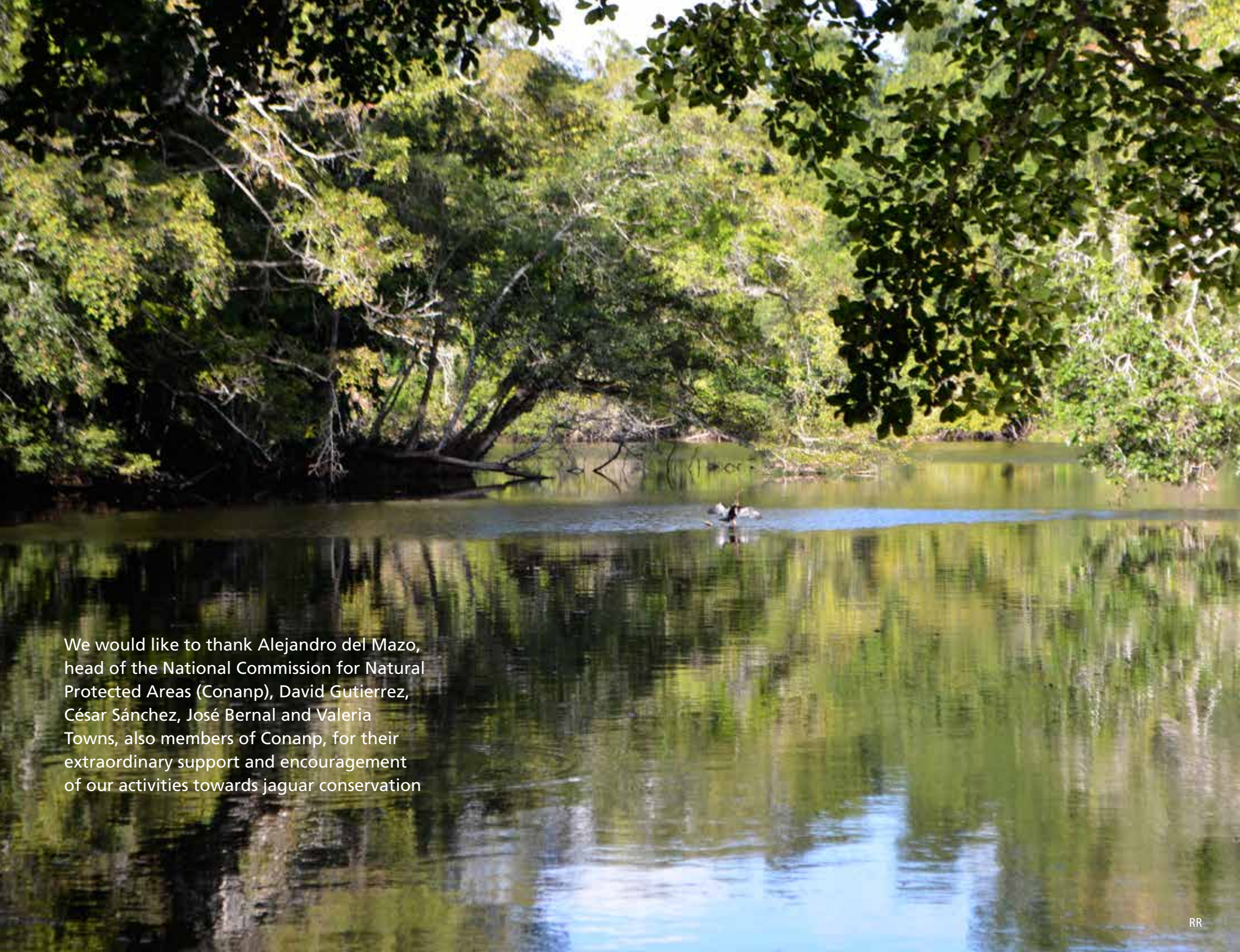

We would like to thank Alejandro del Mazo, head of the National Commission for Natural Protected Areas (Conanp), David Gutierrez, César Sánchez, José Bernal and Valeria Towns, also members of Conanp, for their extraordinary support and encouragement of our activities towards jaguar conservation

RR

Design: Rosalba Becerra

Translation: Valeria Aguilar
and Ronald Bjorkland

Photography, cover: GC, back cover: CB
Carmen Bolaños (CB),
Gerardo Ceballos (GC),
Cuauhtémoc Chávez (CC),
Claudio Contreras Koob (CCK),
Nancy de la Cruz (NC), Daniela Medellín (DM),
Eduardo Ponce (EP), Roberto Ruiz (RR),
Rodrigo Sierra (RS), Staffan Widstrand (SW),
Heliot Zarza (HZ), Alianza WWF–Fundación Telmex
Telcel (WWF-FTT), Instituto de Ecología, UNAM (IE),
photographs taken with camera traps.

Printing: offset Rebosán

Mexico, November 2016

Alianza

FUNDACIÓN TELMEX telcel

CONANP
Comisión Nacional de Áreas Naturales Protegidas

INSTITUTO DE ECOLOGIA UNAM

SERVICIOS ECOLÓGICOS Y CENTRALES

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Ecología y Conservación de Fauna Silvestre