LETTERS

East Asia's Critically Endangered Amur leopard population faces mounting threats.

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Climate change puts Amur leopard at risk

The Amur leopard (*Panthera pardus orientalis*) is a leopard subspecies that has adapted to the East Asian environment near the Amur River, which runs through eastern Russia and along the northern border of China (*1*). Because of human activities such as mining, logging, road building, population growth, and poaching (*2*), the Amur leopard population dropped substantially in the 1970s (*3*). In the years since, conservation efforts have increased the population to be around 40 individuals in China and 70 in Russia (*2*). However, the effects of climate change are exacerbating the threats that this Critically Endangered (*2*) species faces.

Amur leopards live in coniferous-deciduous forests, where they rarely share territory and hunt alone for small animals (*2*). Although much of their habitat is now designated as national parks in southwestern Primorye Province of Russia and the neighboring Jilin and Heilongjiang provinces of China (*4*), rising temperatures and dry conditions driven by climate change have led to increased fires that—combined with human activities and landscape fragmentation—have reduced the leopards' territory and increased cub mortality (*5*, *6*). The spread of wildfires and increased temperatures have increased deforestation. Together with increased hunting of deer and wild boar by humans, this ecosystem degradation has led to reduced ungulate prey and more competition between Amur leopards and Amur tigers (*Panthera tigris altaica*) (*2*). As a result, the predators invade villages and prey upon livestock, increasing human–wildlife conflict and the likelihood that leopards will be killed or injured (*2*).

Climate change has also increased the Amur leopard's vulnerability to disease. Increased temperatures, humidity, and frequency and intensity of extreme weather events have reshaped interactions between species, facilitating the spread of viruses (*7*). In addition, the loss of habitat and stop-over migration areas has caused birds to alter migration patterns, leading to more contact between birds and mammals in East Asia (*8*). Cross-species transmission of disease has increased by an estimated 4000-fold (*9*). Amur leopards have contracted the potentially lethal canine distemper virus (*10*) as well as the highly pathogenic avian influenza H5N1 virus (*11*).

To protect Amur leopards from extinction, future demographic models should include climate change–driven wildfires, interspecies competition, human conflicts, and infectious diseases when predicting population declines. Conservation responses, including vaccination programs, should take these factors into account (*10*). In addition, a multi-pathogen surveillance system should be used to speed up the detection of highly virulent viral strains that infect felids (*12*). Together, these efforts would mitigate the risk of Amur leopard extinction.

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Mining threatens health of Panama's environment

In October, Panama's president, Laurentino Cortizo, signed a contract with Minera Panamá, a subsidiary of First Quantum Minerals Ltd., which the legislature and the executive subsequently approved by

law (*1*, *2*). The agreement gives Minera Panamá the right to use open-pit mining to extract copper and other minerals for at least 20 years from nearly 13,000 ha of land in the Donoso District, Province of Colón (*2*), a protected area in the heart of the Mesoamerican Biological Corridor on Panama's Atlantic coast. The contract reversed previous laws (*3*) and disregarded citizen opinion and the recommendations of scientific institutions (*4*). Civil unrest and strikes have taken place to protest the decision. To protect its important ecosystems, Panama's government must initiate a dialogue with protesters and commit to addressing their concerns.

Open-pit mining requires the complete deforestation of the exploited area, making it one of the most carbon-intensive extractive activities (*5*). The environmental degradation caused by deforestation related to open-pit mining is linked to declines in environmental health and the health of wildlife in surrounding forests and mangroves (*6*, *7*). Open-pit mining also threatens public health by contaminating water sources and polluting air and soil with heavy metals (*7*, *8*). Land use changes in mining areas lead to the loss of farmland, increasing food insecurity and poverty in local communities (*8*). Yet, Panama's contract allows open-pit mining in an area protected by national and international environmental regulations (*9*).

Environmental degradation in this region of Panama would undermine global efforts to mitigate climate change. Panama is one of only three carbon-negative countries in the world (*10*), partly because more than 40% of its territory is covered by forests (*11*). However, the country has weak environmental institutions and lacks the budget for effective monitoring and management of its protected areas (*12*).

With increased mining in protected areas and limited regulations and enforcement, Panama is unlikely to remain carbon negative. To protect its vital ecosystems, the recent contract and related law must be repealed. Instead of allowing mineral extraction, Panama should formulate environmental policies based on scientific evidence, sufficiently consult with its residents, and prioritize the preservation of its protected forests by investing in sustainable development.

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Legislative inertia fails Brazil's Cerrado

The Cerrado, covering approximately 22% of the Brazilian territory, is an ecologically crucial biome (*1*). The region contains rivers such as the Paraná-Paraguay, Araguaia-Tocantins, and São Francisco, as well as the upper catchments of large Amazon tributaries, such as the Xingu and Tapajós (*2*). About 12,000 plant species and 2500 animal species, among which 20% are exclusive to this habitat and roughly 130 are endangered, live in the Cerrado (*3*). However, only 8.21% of the Cerrado is legally protected through Conservation Units (*4*), and human pressures, particularly agricultural expansion, have been responsible for the deforestation of 6 million hectares of native vegetation over the past decade (*5*). Brazil must pass legislation to protect this vital region.

Two legislative proposals that could mitigate deforestation in the Cerrado have been under discussion in the Federal Senate for more than 4 years. Bill No. 1459/2019 (*6*) would amend Law No. 12.651/2012 to increase the areas designated for the protection of native vegetation by 35%. Bill No. 4203/2019 (*7*) would suspend deforestation authorizations in the region for a decade from the date of its approval. A third proposal, Bill No. 1600/2019 (*8*), which aimed to prioritize National Fund for the Environment resources to enhance and restore Cerrado biome environmental quality, was rejected in April 2023 (*9*).

Brazil's failure to pass these proposed laws impedes the implementation of effective measures to mitigate deforestation in the Cerrado. Brazil's representatives must commit to reversing this trend. Future legislative initiatives should consider the biome not only as a national heritage but as a pivotal component for environmental balance. Such initiatives could focus on passing the bills described, introducing new proposals with similar goals, or a combination of both.

Preserving the Cerrado demands concrete actions, including investments in research, implementation of sustainable practices, rigorous monitoring to curb deforestation, and an effective commitment within the legislative bodies. Brazil's citizens, and especially its scientists, should hold their government accountable.

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