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## Veterinary Medicine and the COVID-19 Pandemic: An International, Interdisciplinary Study of a GlobalWicked Problem

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# Veterinary Medicine and the COVID-19 Pandemic: An International, Interdisciplinary Study of a Global Wicked Problem

Daniella Fedak-Lengel

**Abstract:** Building on field research in Costa Rica and Belize, this study analyzes environmental and endangered animal protection policies, rights, and practices in Central America, and assesses impacts of veterinary science and conservation biology on animal welfare concerns. Informed by the recent surge in awareness regarding the spread of zoonotic diseases, given COVID-19, the study analyzes *Manis javanica* and the impact of illegal trafficking of this critically endangered animal. The project theorizes if awareness of zoonotic disease transmission, especially during a global pandemic, could be key to reducing sales, legal or illegal, of wild animals in order to mitigate zoonotic infection spread. Given nearly sixty percent of all emerging infectious diseases are zoonotic in nature, and seventy-one percent of those zoonotic diseases originate in wildlife, the project argues the current global pandemic could be instrumental in raising awareness of and encouraging policy development on reduction of illegal trafficking of critically endangered species.

**Keywords:** COVID-19 pandemic, illegal trafficking of critically endangered species, *Manis javanica*, zoonotic infection spread

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An entirely new vocabulary was introduced to the world in January 2020. The attention to what was originally identified by the World Health Organization China Country Office (cited in Lawrence, 21) as “cases of pneumonia of unknown etiology” (Lu, Stratton, and Tang), or unknown cause, was called, first “novel coronavirus infection pneumonia,” then SARS-nCov, SARS-CoV-2, and COVID-19. These terms were followed by others, previously unused among people outside science and medicine—PPE, R-nought, Hydroxychloroquine, and others not used frequently, such as quarantine, contact tracing, social distancing, and flattening the curve, and a new awareness of geography—first of Wuhan in the Hubei Province of China and then of Bergamo, Italy, in the northern Lombardy region.

It also reminded the world of other things in the not-too-distant past—diseases of the past few decades, such as Avian flu/SARS, Mad Cow Disease, Ebola, Middle East Respiratory Syndrome or MERS (few people knew early on in 2020 that this, too, started with a coronavirus, MERS-CoV), and of many centuries ago, such as the “Black Death” (circa 1342-1356) and the Great Plague of London in 1665. All of these had a common thread—a connection to non-human animals.

This thread—the connection of non-human animals to deadly diseases in humans—is one of the foci of this study which addresses the current, crucial topic of zoonotic disease spread. The awareness of zoonosis has never been so critical as it is today—during the ongoing global pandemic. “In the last 30 or 40 years, there have been zoonotic outbreaks at a much frequent pace than before, many of those have been related to wildlife trade” (Millan 32). “Zoonotic diseases today account for around sixty percent of all emerging infectious diseases, and seventy-one percent of these originate in wildlife” (Anand & Batra para. 1). Who had heard of the pangolin before SARS-CoV-2? While many people had some idea that “aviary flu” had something to do with birds and that Zika was spread by mosquitoes, beyond that, there was very little knowledge or awareness of zoonotic diseases...not only are non-human animals dying at unprecedented rates, but, given the current deadly COVID-19 pandemic, humans are dying at unprecedented rates, possibly due to the transmission of diseases from non-human animals to humans.

## **Tackling “Wicked Problems”**

Informed by field research in Belize and Costa Rica, this study analyzes the impact of veterinary science and biological research and practice, particularly conservation biology, on the COVID-19 Pandemic. The study is part of an emerging interdisciplinary research program analyzing national and international policies on endangered animals and conservation, veterinary biology policy

history, illegal trade and law enforcement, the intrinsic value of these animals, and zoonosis. The study centers on the following research question:

RQ: Can the COVID-19 pandemic help to raise awareness of zoonotic disease spread and, if so, can this awareness help to reduce instances of illegal wildlife trafficking?

A subset of mail artists The above research question is one of many that must be asked about the COVID-19 pandemic, which many researchers (Auld, Bernstein, Cashore and Levin; Cohen & Cromwell; Pourdehnad, Starr, Koerwer, Scott, & McCloskey; Schiefloe) have labeled a “wicked” problem. David Kerr and Namino Glantz characterize a wicked problem as one that “persists in perpetuity because of incomplete information, multiple (often selfish) stakeholder interests, a large economic burden, and a ripple effect whereby every action triggers a reaction with other wicked problems.” They argue “COVID-19 is also a classic wicked problem, as evidenced by the unanticipated and disproportionate effect of the virus on minority racial and ethnic populations and individuals who have experienced health disparities” (873).

Addressing a wicked problem requires interdisciplinarity. Thus this literature review spans a range of disciplines including veterinary science, immunology of infectious diseases, conservation biology, policy on endangered animals and conservation, policy history, illegal trade and law enforcement, and the biological, immunological, epidemiological, and ecological properties of viral, bacterial, and protozoan diseases of animals and humans, including vectors from certain pathogens. All of these interdisciplinary areas of study are needed to investigate “wicked” problems through multi-faceted and collaborative research, advocacy, and action.

Following the work of wildlife veterinarians (see, for instance, Cattet), this study argues that an interdisciplinary, collaborative effort is needed as well as an increased “mutual understanding between fields with respect to the other’s training and experience in addressing animal welfare issues” (33). For instance, in “Falling Through the Cracks: Shortcomings in the Collaboration Between Biologists and Veterinarians and Their Consequences for Wildlife,” Marc Cattet, DVM, Ph.D. argues, “Although biologists and veterinarians have shown considerable success in working together to address wildlife-related issues, including disease, chemical immobilization, reproductive biology, and conservation biology, examples of shared efforts to evaluate and ensure the welfare of study animals are mostly absent” (33). An interdisciplinary, collaborative effort is needed as well as an increased “mutual understanding between fields with respect to the other’s training and experience in addressing animal welfare issues. In effect, each assumes that the final word on animal welfare rests with the other. The reality is, however, that neither field contains the knowledge and skills

required to address animal welfare concerns alone” (Cattet 33).

In their recent article, in the *Lancet*, titled, “Diabetes, like COVID-19, is a wicked problem,” David Kerr and Namino Glantz characterize a wicked problem as one that “persists in perpetuity because of incomplete information, multiple (often selfish) stakeholder interests, a large economic burden, and a ripple effect whereby every action triggers a reaction with other wicked problems.”

By contrast, “Tame problems can be solved by having engineers, clinicians, and scientists develop guidelines, algorithms, and systems that achieve easily measured outcomes that matter to these same stakeholders.” Kerr and Glantz argue “COVID-19 is also a classic wicked problem, as evidenced by the unanticipated and disproportionate effect of the virus on minority racial and ethnic populations and individuals who have experienced health disparities” (873).

I argue that studying the pandemic is even more wicked, in an interdisciplinary sense, because it draws in even more areas of study including but not limited to history, given its links to the pandemics from the Justinian plague to the 14th century Bubonic plague to the 1918 so-called “Spanish flu.” Kerr and Glantz note “As the COVID-19 example shows, there is no single, correct, definite answer to a wicked problem” (874). There are also issues emerging during the pandemic that extend far beyond science and medicine. These include ethnonationalism and racism. Given the racism that has emerged in pandemics in history, and in the present, it also needs study from medical humanities, from economics and global trade, from ethnicity and cultural studies, and from journalism and media literacy—due to its “fake news” disinformation and misinformation; and from political science, given the way COVID-19 has been politicized.

Addressing the “wicked” problem of the COVID-19 pandemic relates to an even more “wicked” problem of climate change, or what many scientists and environmental sustainability advocates and activists argue should be widely named the “extinction crisis” (Center for Biological Diversity). What should be called the extinction crisis is certainly a wicked problem. For instance, at the thirty year anniversary of the U.S. Endangered Species Act (ESA), Scott, Goble and Davis, wrote “It has been thirty years since the ESA was signed into law on December 28, 1973, and the task of conserving at-risk species is more complex than ever” (4).

Elsewhere (Fedak-Lengel), I have expanded my analysis on the philosophical foundation of this study, which centers on the question posed by my professor of Philosophy, Dr. Justin Donhauser: “Is there any good reason to take measures to protect endangered species that have no value for anything we care about?” (237). There are several environmental philosophers who are asking this and related questions concerning the valuation of species in terms of value of individual

organisms that construct the species population, the worth of individuals in a given species population is grounded in the representational goals of those specific organisms, and species preservationist ethics (see, for instance, Adams; Agar; Brown & Shogren; Callicott; Courchamp, Angulo, Rivalan, Hall, Signoret, et al.; Davidson; Donhauser; Douglas & Alie; Hall, Milner-Gulland, & Courchamp; Maguire & Justus; McCord; Sandler). Their research focuses on reasons to protect these species and the definitions of intrinsic value, specifically reasons as to why species obtain intrinsic value as well as alternate perspectives surrounding the topic. [Endnote 1]

One of the most important scholars in this area is Ian Smith who, in his book, *The Intrinsic Value of Endangered Species*, defines the concept of intrinsic value, which can be defined as an artefact, entity, or individual must have value regardless of whether it is useful as a means to promote other ends or goals (see, also, Lau). It has been argued throughout history that living beings have intrinsic value, and it has also been argued that anything with intrinsic value should be protected on the basis of morality and innate human obligation. Although this value assessment applies to a wide range of subjects, this paper focuses on endangered species. Protection for endangered species has always been noted as controversial, due to the fact that 99% of currently threatened species are at risk from human activities, primarily those driving habitat loss, introduction of exotic species, and the climate catastrophe.

## **Exploitative Trafficking**

The most horrifying contrast to the intrinsic value of endangered species is monetary value placed upon them in the illegal sales of them. In April 2020 the United Nations Office of Drugs and Crime estimated that the illegal wildlife trade is worth as high as \$23 billion (USD) annually. Given the financial crises that many people throughout the world experienced during the COVID-19 pandemic, that figure is likely to rise substantially as more people have turned to illegal activities to survive.

In addition to exacerbating the extinction crisis, the illegal wildlife trade is additionally problematic as it leads not only to the elimination of endangered species and reduction of global biodiversity, but also increases organized crime and corruption, harms legal economic practices, and, as evidenced by the COVID-19 pandemic, can threaten humans' health through the increased possibility of zoonotic disease spread to humans.

Several scientific researchers have invited the world to learn lessons from the COVID-19 as it relates to "probable animal origin" of the severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2, the virus that causes COVID-19 (Decaro and Lorusso 1). In their article, "Novel Human Coronavirus (SARS-

CoV-2): A Lesson from Animal Coronaviruses,” in *Veterinary Microbiology*, Nicola Decaro and Alessia Lorusso note that “A number of human coronaviruses that originated in animals have emerged in less than two decades” (1).

Elsewhere (Abdul-Aziz, Fedak-Lengel and Lengel), with particular focus on the Middle East and North Africa, we have taken an interdisciplinary stance, among others, on the negative impact of illegal animal trafficking. In “Drivers for Animal Welfare Policies in the Middle East,” Aidaros argues, “while non-human creation is subjugated to human needs, the proper human role is that of conscientious steward and not exploiter” (84).

## **Veterinary Science Denial**

Scientific advances have been publicly denied all throughout history, and science denial is even more prevalent in the age of technology, specifically through use of the internet and web browsing. Infinite information that is readily available through search engines can pose serious risk on the credibility of scientific discoveries. Many sources available contain inaccurate or unreliable content, which makes it more difficult to differentiate between authentic advancements and misconceptions, and with increasing information, there comes increasing and strong biases. Scientific approach poses threats to mindsets that are stuck in mythic modes of thinking, which makes it extremely difficult to create mass agreement on certain controversial issues, such as the onset and eradication plans of COVID-19.

Citing experts from the American Veterinary Medical Association, the Federation of Veterinarians of Europe, the Australian Veterinary Association, among others (See Duan, Kluger, and Lengyel), Jordan argues, a small, but very vocal “subset of veterinarians routinely denounces scientific veterinary medicine as worthless or actively harmful, and promotes alternative approaches for diagnosing and treating disease” (par. 10). The problem with this subset is that they “not only rely on untested, unproven, or demonstrably useless methods such as homeopathy, energy medicine, esoteric diets, herbal remedies, and many others, but they promote these by claiming the vaccines, medicine, foods, and other interventions developed and supported by scientific research cause disease more than prevent or treat it” (par. 10). A broader problem with veterinary science denial is that it contributes to broader concerns about dis- and misinformation, which has risen substantially during the COVID-19 pandemic.

## **Methodology: Veterinary Science Field Research in Belize**

Complex problems require what is called “triangulated” methodological approach Bekhet and Zauszniewski methodological triangulation as an approach that “involves using more than one kind of method to study a phenomenon. It has been found to be beneficial in providing confirmation of findings, more comprehensive data, increased validity and enhanced understanding of studied phenomena (40). This study is part of a larger research program analyzing wildlife conservation policy priorities (including social, political, and environmental policy priorities) in the Americas, and the effectiveness of these national policies, in coordination with international organizations such as the United Nations Environmental Program, and policies and conventions, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In addition to the policy analysis, case study and extensive literature review, it was the field research in Belize that made the greatest impact on my learning about endangered and critically endangered animals, and the widespread problem of illegal trafficking of these animals.

The methodology of this particular study builds on preliminary field research in Costa Rica and field research in Belize, as well as analysis of animal welfare and conservation policies, including translation of policies from Spanish to English, and a case study of zoonotic disease spread of endangered animals.

The field research occurred during a veterinary science study abroad program in San Ignacio, Cayo Belize, in the Central American and Caribbean region. I drew upon the knowledge I gained from what was a pilot field research project, which was a June to July 2016 two-week trip to Costa Rica. The in-field experience in Belize occurred at the Belize Wildlife and Referral Clinic through the University of Florida Department of Wildlife Ecology and Conservation program in Belize and the Wildlife Institute, whose mission is to support opportunities for veterinary study abroad, and the Belize Wildlife Conservation and Sustainable Development through Collaboration. These organizations collaborate with undergraduate and graduate students, veterinary medical professionals and educators, and the Government of Belize and other national and international wildlife health professionals to develop national guidelines concerning wildlife and human health, to support wildlife conservation animal health and welfare, and the veterinary profession in Belize through medical services, education, research, and collaboration.



The Belize Wildlife Referral Clinic broadened my knowledge about the vastly unknown world of the dangers of exotic pet trade and the importance of veterinary practice to assist in combating the malpractices associated with this phenomenon. For instance, in their article in the journal *Biological Conservation*, Auliya, et al. note, “[o]f the 10,272 currently recognized reptile species, the trade of fewer than 8% are regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the European Wildlife Trade Regulations (EWTR)” (103). However, Auliya, et al. report that “the International Union for Conservation of Nature (IUCN) Red List has assessed 45% of the world’s reptile species and determined that at least 1390 species are threatened by ‘biological resource use’. Of these, 355 species are intentionally targeted by collectors, including 194 non-CITES-listed species. Herein we review the global reptile pet trade, its impacts, and its contribution to the overharvesting of species and populations, in light of current international law” (103).

In order to preserve the endangered ecosystem that Belize is battling, due to poachers and the imposed economic value behind the endangered species present, the Wildlife Protection Act-Wildlife law in Belize. This law reduced the cases of poaching tremendously, however many cases are still observed. These policies have not been very effective in decreasing the amount of abductions and poachings.

## **Could Awareness of Zoonotic Disease Spread by *Manis javanica* Halt Traffickers?**

Early on during the spread of SARS-CoV-2, in early February 2020, Lam et al., in their study, “Identification of 2019-nCoV related coronaviruses in Malayan pangolins in southern China,” reported a possible “identification of 2019-nCoV related coronaviruses in pangolins (*Manis javanica*) seized in anti-smuggling operations in southern China” (1). The outbreak of the, at the time, very new, frightening disease was linked with a so-called “wet market” in Wuhan, China, that sold live, wild animals. It was certain types of animals that Lam et al. posited as “the source of zoonotic infection.” The researchers argued, “Although bats are likely reservoir hosts for 2019-nCoV, the identity of any intermediate host facilitating transfer to humans is unknown” (1). They argued that “the identification of 2019-nCoV related coronaviruses in pangolins (*Manis javanica*) seized in anti-smuggling operations in southern China” could be a causal link to the human disease outbreak (1). They reported, “Metagenomic sequencing identified pangolin associated CoVs that belong to two sub-lineages of 2019-nCoV related coronaviruses, including one very closely related to 2019-nCoV in the receptor-binding domain. The discovery of multiple lineages of pangolin coronavirus and their similarity to 2019-nCoV suggests that pangolins

should be considered as possible intermediate hosts for this novel human virus and should be removed from wet markets to prevent zoonotic transmission” (1).

Others also highlighted *Manis javanica* as a possible origination of 2019-nCoV-2 (Wu et al.). The Organisation for Economic Co-operation and Development (OECD) argue: “The ongoing Covid crisis has brought renewed attention to the global problem of wildlife trafficking. The World Health Organization has determined that COVID-19, just like SARS, Ebola, Bird Flu, and MERS, originated from an animal” (1). OECD cited scientists including Lam et al. who “claim that smuggling of pangolins in South-East Asia could be one of the triggers of the current crisis, as these smuggled animals carried viruses closely related to coronavirus. In fact, pangolins are the most-commonly illegally trafficked animal in South East Asia, used both as food and in traditional medicine” (OECD 1). Previous research also analyzed *Manis javanica*, focusing on international trafficking and exploitation (Challender, Heinrich, Shepherd, and Katsis; Heinrich et al.; Ingram, Coad, Abernethy, Maisels, Stokes, Bobo, et al.; Liu et al.). Liu et al., for example, found that “viral metagenomics revealed sendai virus and coronavirus infections” in *Manis javanica* [Malayan pangolin] (12).

Other researchers have contested that the pangolin was the zoonotic link to the COVID-19 pandemic. Professor David Macdonald, Director of WildCRU which is part of the Department of Zoology at the University of Oxford, reported on that a research team sent by the World Health Organization to Wuhan from 14 January to 10 February 2021 to try to determine what animals were being sold in the so-called wet markets in Wuhan before they were closed in early January 2020. Macdonald’s research team found that no pangolin or bat species were for sale in the any of the 17 shops in the Wuhan markets (Xiao et al.). Other researchers have also indicated that there is no blame to be placed on the pangolin (Frutos et al.; Xiao Xiao et al.). Nevertheless, the attention to pangolins and bats and possible links to the pandemic likely raised awareness about these animals and, in the case of pangolins, particularly *Manis javanica*, there is hope that there will be more commitment to protecting such endangered species, at least for the goal of reducing the risk of zoonotic disease spread, whether or not *Manis javanica* had any connection to SARS-CoV2 (Heighton and Gaubert; Thomson and Fletcher).

Awareness raising is of utmost importance because pangolins are “among the most extensively traded taxa in southeastern Asia mainly due to the perceived medicinal value of their scales and other body parts, putting them at risk of extinction” (Phuyal et al., 2023 1). Perhaps the most important work is communicating emerging scientific research to the public. Media organizations, such as the BBC, Reuters, Al Jazeera, among others, have done an impressive job of drawing attention to the pangolin, both in terms of its critically endangered

status, but also its links to SARS-CoV2 and the COVID-19 pandemic (Briggs). Similarly, civil society and non-governmental organizations such as the Iguana Specialist Group have played an important role in raising awareness about zoonosis (See, also, Anand and Batra; FUNCI; GVI) and to the threats to the pangolin (IUCN SSC Pangolin Specialist Group).

## **Innovative Collaboration and Cooperation Needed to Increase the Success of Animal Protection Laws and Policies**

Various non-governmental organizations and governmental agencies are centrally involved in developing, implementing, and enforcing animal protection laws and policies. The first is the World Wildlife Fund (WWF) which provides assistance to communities to conserve their natural resources, transform policies into more sustainable ones, and protect the animals along with their habitats. Their local efforts can be reflected onto a global scale. One organization is the International Union for Conservation of Nature (IUCN). It is a network of global government and civil society organizations that provides private, public, and non-governmental organizations information on how to balance human life and economic growth with conservation of wildlife.

Through my field research in Belize, I discovered an outstanding collaboration at the Belize Wildlife and Referral Clinic. There are similar collaborations throughout Central America and the Caribbean (Acha; Alleyne; Arambulo; Belize Forest Department; Casas Olascoaga, Rosenberg, and Astudillo; Góngora; Harbison; Nelson; Peery Wildlife Ecology & Conservation Lab; RUSVM). Still, much more needs to be done to address this and other “wicked” problems on a global scale, for instance, with continental collaboration between Central America and Europe (Altherr; Henle, Bauch, Auliya, Külvik, and Pe’er, et al.; Iguana Specialist Group), with other considerations, such as poverty as a reason for illegal animal trafficking (Duffy, St. John, Büscher & Brockington; Pangolin Specialist Group). Collaboration and cooperation is needed because, as Dr. Adrian Rabe (cited in Carbonaro), an epidemiologist at Imperial College London, notes, “It appears that consumption of certain animals may predispose our population to new viruses in the future. Our continued intrusion into virus environments and those sanctuaries is also one of the reasons why these pandemics have arisen. And we will probably need to protect those sanctuaries in the future” (para. 14). Rabe and others such, as Dr. Martin Beer, a virologist at the Federal Research Institute for Animal Health in Greifswald, Germany, highlight the fact that related viruses for SARS-CoV-2, the pangolin is a “likely intermediate host for the virus outbreak” (Beer, qtd. in Carbonaro para. 8).

In her study of anthropatriarchy and Hindu nationalism, Yamini Narayanan asks, “How can insights from feminist and animal geographies politicize spaces of

‘sanctuary’ and refuge for animals repatriated from incarceration, exploitation, and violence?’” (195). Given that the COVID-19 pandemic is still current, it is highly likely that there is no more current undergraduate level research outside of this project on the integration of COVID-19 into endangered species protection policies.

More extensive and innovative types of collaboration and cooperation are needed to increase the success of anti-trafficking law and policy enforcement. There are, of course, numerous examples of scientific collaboration to support conservation and preservation of wildlife (Aguirre, Ostfeld, and Daszak; Auliya et al.; Böhm, et al.; Boyle and Bishop). For instance, Drs. Carlos Diez, Jafet Vélez-Valentin, and Antonio Mignucci, worked together to save endangered species in Puerto Rico. They began with 13 Puerto Rican Amazon Parrots, to 130 parrots released in 2017 (Guzman).

Such efforts are encouraging, however, many situations I learned about during my field research were not. For instance, during my time at the Belize Wildlife and Referral Clinic, my research cohort was shown numerous radiographs containing images of howler monkeys with bullets still inside their bodies. A common practice for obtaining howler and spider monkeys is to shoot the mother and steal the infant monkey for trafficking in the illegal animal market. As disturbing as this learning and awareness was during my study in Belize, I realized the importance of proper veterinary care, as well as the importance with public acknowledgment and advocacy. Following the field research in Belize and since the COVID-19 pandemic, I further realized that if more people could be aware of the harms involved with obtaining exotic animals, there may be a reduction in demand for the trafficking and possession of species at risk of extinction.

## Directions for Future Research

This study, and the larger Honors Thesis project, was a life transforming experience. The field research in Belize opened my eyes to the widespread problem of illegal trafficking of endangered and critically endangered species. The field research in Belize Wildlife and Referral Clinic will guide my future career in veterinary medicine. It ignited a passion for future international field research. The analysis environmental and endangered animal protection policies, rights, and practices in Central America and the Caribbean, lead me to understand ways to combat the problem of animal trafficking, but also revealed that laws and policies may have limited impact on reducing trafficking. The impact of veterinary science and biological research and practice, particularly conservation biology, can have a positive impact on animal welfare concerns. Perhaps the increased awareness about the spread of zoonotic diseases, given the current global COVID-19, especially for critically endangered animals such as *Manis javanica*, may be the most powerful impact on reducing animal trafficking.

Ongoing research is needed to assess the need for new and innovative types of collaboration, particularly involving numerous scientific disciplines, law and policy makers, global trade, and technology experts, to analyze and find better practices to save endangered and critically endangered species. Collaboration in the area of public health campaigns and health communication, can also help to raise awareness of zoonotic disease transmission, especially during a global pandemic, which could be key to reducing the sale, legal or illegal, of wild animals in order to mitigate zoonotic infection spread. More research on infectious diseases COVID-19 pandemic could be instrumental in new awareness and policy development that can reduce illegal trafficking of endangered and critically endangered species.

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