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STOPPING THE SPREAD: EXAMINING THE INCREASED RISK OF ZOONOTIC DISEASE FROM ILLEGAL WILDLIFE TRAFFICKING

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ONE HUNDRED SIXTEENTH CONGRESS

SECOND SESSION

JULY 22, 2020

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SECOND SESSION

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STOPPING THE SPREAD: EXAMINING THE INCREASED RISK OF ZOONOTIC DISEASE FROM ILLEGAL WILDLIFE TRAFFICKING

WEDNESDAY, JULY 22, 2020

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The Committee met, pursuant to notice, at 10:06 a.m. in room 406, Dirksen Senate Office Building, Hon. John Barrasso (Chairman of the Committee) presiding.

Present: Senators Barrasso, Carper, Braun, Rounds, Sullivan, Boozman, Ernst, Cardin, Whitehouse, Gillibrand, Booker, and Van Hollen.

Senator BARRASSO. I call this hearing to order.

Good morning. Welcome.

We have three witnesses who are joining us today to discuss what occurred late last year, a new disease reported in Western China. Since then, COVID-19 has disrupted life around the world, taken hundreds of thousands of lives, and devastated the global economy.

While much is still unknown about the origins of COVID-19, experts agree that it is a zoonotic disease, and that is the purpose of this hearing.

Due to the fact that a number of hearings are going on at the same time today, I am asking Ranking Member Carper to make his opening statement before I do, so that he can go participate in a markup that is happening at the Homeland Security Committee.

Senator Carper.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Mr. Chairman, thank you very much for your kindness, and I want to say to Catherine, to Dan, and to Jonathan, thank you, welcome in person, and from a distance. We are delighted to see you and appreciate your presence and your testimony.

Mr. Chairman, thanks a whole lot for holding our hearing today, and while we have the Homeland Security Committee's meeting simultaneously right now with 28 bills in our markup, several of mine, so I am going to slip out for a while. I promise I will come back and ask some questions.

While I believe it is critically important that we examine the ways in which we can prevent future pandemics, I would be remiss

if I did not begin by acknowledging the severity of our own ongoing crisis. To put it plainly, Americans are suffering as the coronavirus continues to spread. We know that.

More than 500 Delawarians have tragically lost their lives due to this disease, along with more than 140,000 other Americans, 140,000. To put those numbers in context, 25 percent of all COVID-19 related deaths that have occurred on this planet have occurred in our country, despite the fact that Americans constitute less that 5 percent of the world's population.

Think about that, 25 percent. Getting this deadly virus under control and providing assistance to those who need it most must remain our primary focus.

With that said, experts around the globe have acknowledged the connection between wildlife trade and the emergence of COVID-19. I appreciate the opportunity that we have here today to examine and better understand that connection.

I have to be honest with you, Mr. Chairman and colleagues, in the Carper household, we don't use the word zoonotic every day. That is not an everyday source of conversation. We talk about baseball, the Detroit Tigers, and since the Tigers haven't given us much to talk about, recently at least, we have been spending a bit more time learning about some new things, and that includes zoonotic diseases.

People may tune into our hearing today and wonder, what is zoonotic disease anyway? They might not realize that these days, zoonotic diseases have become a matter of our everyday lives and a topic of our daily conversation.

Zoonotic diseases are diseases that are transmitted from animals to humans. Believe it or not, at least 61 percent of human diseases are zoonotic in nature.

Some well known examples of zoonotic diseases include the West Nile virus, Lyme disease, and rabies. Another example of a zoonotic disease is the 2019 novel coronavirus, also known as COVID-19, or simply the coronavirus.

While we still don't exactly know how the coronavirus made the leap from wildlife to human beings, we do know that unnatural conditions in live wildlife markets in China known as wet markets likely played a role.

While tens of thousands of our own countrymen and women die from this virulent disease, it would be easy for us to simply point to the role that China and other countries play in wildlife trafficking and place blame. But the truth is that our country also plays a significant role in the global wildlife trade.

For example, wet markets exist in the United States, too. They are not exactly like the wet markets found in Asia and elsewhere, and they are not as prevalent, but they do exist, and they may pose a real risk to human beings.

As we consider the connection between illegal wildlife trafficking and zoonotic diseases, I hope we will not just place the blame on other countries, but rather do what is right by also reflecting upon our own practices here in the United States. We need to discuss how we as a country can better support our own State and Federal efforts to combat zoonotic diseases.

For starters, there is a lot more we can do as a country to bolster research and encourage coordination regarding zoonotic diseases. To that end, I look forward to hearing ideas and advice from our esteemed panel of witnesses, particularly ideas for the U.S. Fish and Wildlife Service, which is in the jurisdiction of our Committee.

We can also step up our efforts to support law enforcement in other countries and help those countries build capacity to combat wildlife trafficking. The United States can lead by example in this regard by working with other countries to reduce demand like we have done successfully in the past for highly trafficked parts such as animal parts, such as ivory.

Moreover, it is worth noting that some of the international wildlife trade that could contribute to the emergence of future pandemics is legal. When it comes to legal wildlife trade, the United States, I am told, is a top importer of live animals. Much of this global trade is economically important, sustainable, and poses little risk to human health, but perhaps not all of it is. We may need to make difficult decisions and fundamentally change some of the ways in which we interact with wildlife right here in the United States and around the world.

We know that natural, resilient ecosystems, when left to their own devices, thrive and support biodiversity. Biodiversity supports a healthier planet. But when we interfere and create unnatural conditions, the unintended consequences can sometimes be severe. For instance, wet markets increase the chance for disease transmission between species and then, ultimately to us, to human beings.

Climate change may also create problematic, unnatural circumstances. For example, resource scarcity driven by climate change will cause humans to interact with new animals. As such, new wildlife species will likely be traded, increasing the already high risk for the spread of zoonotic disease. At the same time, as climate change continues to displace and disrupt both human and non-human populations, scientists expect that disease susceptibility will increase.

As we seek to prevent future pandemics caused by zoonotic disease, we would be wise to try and minimize the forces of uncertainty. We have learned that climate change will almost certainly bring with it more uncertainty to the management of zoonotic diseases, which is one more reason why addressing climate change is critical to the prevention of future pandemics.

When the United States addresses its shortfalls at home in the interest of creating a more perfect union and a better world, we need to send a strong signal to both friends and foes abroad when we lead by our example. That is precisely what I hope we will strive to do as we contemplate the next steps to combat wildlife trafficking and the prevention of future pandemics.

In closing, Mr. Chairman, thank you for this hearing.

I want to thank our staffs, both on the majority side, and I want to thank Elizabeth Mabry, who is sitting behind me over my right shoulder for her passion on these related issues. Thank you so much.

I will be back soon. Thanks.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM THE STATE OF WYOMING

Senator BARRASSO. Thank you, Senator Carper.

To continue, zoonotic diseases are caused by germs, germs that spread between animals and humans, and can lead to many types of illnesses and even to death. Scientists estimate that about 75 percent of newer emerging infectious diseases in people originate in animals.

COVID-19 is not the first disease to come from wildlife. HIV, SARS, MERS, Ebola, West Nile virus, Lyme disease, are all examples of zoonotic diseases.

A variety of factors increase the risk of an outbreak of these diseases, including illegal wildlife trafficking and unregulated wildlife trade, poor sanitation practices when handling raw or minimally processed meat that comes from wild animals, known as bushmeat, changing land use practices, and global travel that makes it very possible for diseases to rapidly move from remote locations to urban centers and around the world in a matter of days.

Many countries facilitate illegal wildlife trafficking, unregulated wildlife trade, and poor sanitation practices when handling bushmeat. They elevate the risk of spreading disease and should be held accountable.

China is one of the most egregious actors. According to a December 2018 report by the U.S.-China Economic and Security Review Commission, "China is widely recognized as the world's largest market for trafficked wildlife products."

Chinese demand for trafficked wildlife has contributed to population declines of iconic species such as elephants, rhinos, tigers, as well as lesser known species.

For years, scientists have voiced concerns about China's poor sanitation practices when handling bushmeat.

Almost 15 years ago, the journal Current Opinions on Infectious Diseases, published an article entitled "Infectious Diseases Emerging from Chinese Wet Markets: Zoonotic Origins of Severe Respiratory Viral Infections." It called these wet markets a unique place for transmission of zoonotic disease to humans.

In April, Secretary of State Mike Pompeo called on China to permanently close its wet markets, citing the "strong link between illegal wildlife sold in wet markets and zoonotic diseases."

That same month, Dr. Anthony Fauci, Director of the National Institute of Allergy and Infectious Disease, told the morning news program Fox and Friends that the current public health crisis is a direct result—a direct result—of China's wet markets.

China announced a permanent ban on wildlife trade and consumption in February, but the action was met with skepticism. In an analysis it published in response to China's announcement, the Wildlife Conservation Society called it a good step, but warned, a potential loophole for traffickers which may exploit the non-food exemptions to sell or trade live wildlife, creating additional challenges to law enforcement officers.

The skepticism, I believe, is well founded. China took similar steps in response to the 2003 SARS outbreak, only to reverse them once the spotlight was off the crisis.

This Committee has jurisdiction over the U.S. Fish and Wildlife Service, which has the primary responsibility for implementing the Convention on International Trade in Endangered Species, CITES; you know it well.

The Fish and Wildlife Service issues permits for the import or export of protected species. It also has domestic and international law enforcement and investigative responsibilities related to wildlife trafficking. Part of that work includes inspecting cargo for wildlife contraband and providing grants aimed at preventing wildlife trafficking.

This Committee also has jurisdiction over the Endangered Species Act and the Lacey Act. The Committee has taken action to address illegal wildlife trafficking and unregulated wildlife trade. In 2019, the Committee successfully reauthorized the Multinational Species Conservation Funds, which provide grants to help conserve elephants, rhinos, great apes, tigers, from poachers and wildlife traffickers.

We also established the Theodore Roosevelt Genius Prizes. These prizes provide cash awards to encourage technological innovation to address challenges confronting wildlife, including protecting endangered species and preventing wildlife poaching and trafficking.

We accomplished these and other important wildlife conservation priorities in the Wildlife Innovation and Longevity Driver Act, the WILD Act, which I sponsored along with Senators Carper and Inhofe and Booker and Boozman and Whitehouse. Totally bipartisan. The WILD Act was signed into law last March, March 12th, 2019.

I look forward to continuing to work with my colleagues to ensure China and other countries are held accountable and take appropriate action to minimize the risk of future disease outbreaks. Illegal wildlife trafficking, unregulated wildlife trade, and poor sanitary practices increase the risk of diseases spreading from animals to humans. China is the prime bad actor in facilitating the spread of such diseases and must be held accountable.

We are now going to hear from our witnesses, and I am delighted that all of you are here today. Catherine Semcer, who is the Research Fellow at Property and Environment Research Center; Dr. Jonathan Epstein, Vice President for Science and Outreach at EcoHealth Alliance who is joining us remotely today from Long Island, New York; and Hon. Dan Ashe, who is well known as a friend of this Committee and has testified over the years, who is now President and CEO of the Association of Zoos and Aquariums.

I would like to remind the witnesses that your full written testimony will be made part of the official hearing record, so please keep your statements to 5 minutes so that we may have time for questions.

I look forward to your testimony, and I ask Ms. Semcer to please proceed.

STATEMENT OF CATHERINE SEMCER, RESEARCH FELLOW, PROPERTY AND ENVIRONMENT RESEARCH CENTER

Ms. SEMCER. Chairman Barrasso, Ranking Member Carper, members of the Committee. My name is Catherine Semcer, and I am a research fellow with the Property and Environment Research

Center, a conservation research institute based in Bozeman, Montana.

Prior to joining PERC, I was part of the leadership team of a U.S. based non-governmental organization that provides training, advisory assistance, and procurement services to African counter-poaching programs.

The United States recognizes wildlife trafficking, ecosystem degradation, and pandemic disease as interrelated threats to national security. Habitat destruction and direct human contact with some species of wildlife increases the risk of zoonotic disease transmission from wildlife to humans. So our environmental stewardship will determine whether or not the scale of these threats increases or diminishes.

This is especially true in regard to our engagements in Africa, where the potential for another pandemic to arise as a result of deforestation or wildlife trafficked out of the continent's wild lands is high.

Currently, Chinese investment influence over natural resource management in Africa threatens to remove the natural buffer between humans and disease carrying wildlife. Despite the efforts of the Chinese government to encourage environmentally responsible behavior among its companies and nationals working in Africa, their extensive involvement in deforestation and wildlife trafficking is putting more humans in direct contact with wildlife, increasing the risk of disease transmission.

For example, in the Congo Basin, where Chinese investment in the timber sector is high, recent research has shown the number of logging roads penetrating the rainforest has increased by more than 40 percent since 2003.

Just this week, Malawi convicted seven Chinese nationals involved in the trafficking of pangolin scales, a crime believed to present an especially high risk of facilitating the spread of disease.

The longstanding efforts of the Chinese government to decrease involvement of their citizens in these harmful activities have not met with desired levels of effectiveness at the necessary speed to ensure our collective security. Despite demand reduction campaigns and outright bans on illegally harvested timber, ivory, pangolin, and other products, Chinese consumer demand continues to drive these activities.

China is the world's largest market for timber, and an estimated 75 percent of all raw logs exported from Africa are destined for the Chinese market. The 2020 World Wildlife Crime Report issued by the United Nations earlier this month stated that China remains a leading destination for seized rhino horn and pangolin shipments.

The United States, through the programs of the U.S. Fish and Wildlife Service and other agencies, must take an increased leadership role in efforts to secure global health by conserving ecosystems and curtailing wildlife trafficking, especially in and from Africa. Policies under the Endangered Species Act can play a key role in delivering the necessary U.S. leadership.

Because many African nations rely on sustainable hunting programs to incentivize the habitat conservation and anti-poaching efforts, the regulatory obstacles created by species listing and hunting trophy import decisions can undermine the ability of African

nations to maintain healthy ecosystems and combat wildlife trafficking at the beginning of the supply chain.

Currently, sustainable hunting programs conserve an area of habitat in Africa that is more than twice the size of the U.S. National Park System. This conservation is an outgrowth of the economic incentives and revenues hunting generates for rural communities and private landowners.

Restrictions on the importation of hunting trophies into the U.S. stemming from the Endangered Species Act have caused the abandonment of at least 6 million acres in Tanzania that had been conserved from hunting revenues. Some of this land is now being cleared for agriculture, resulting in ecosystem degradation and increased risk of viral spillover.

African wildlife authorities also derive significant revenue from hunting related fees. In Tanzania, all of the anti-poaching operations of the Tanzania Wildlife Management Authority have been funded with hunting related revenues, while in Zimbabwe, the Zimbabwe Parks and Wildlife Management Authority derives 30 percent of its operating budget from hunting licenses and fees.

Improving the Endangered Species Act by requiring that listing and importation decisions take into account the ability of range nations to finance habitat conservation and field anti-poaching programs can strengthen the likelihood of containing bio-threats and interrupting the supply chain of trafficked wildlife at or close to its source. This will reduce the risk of disease spread and improve our collective security.

For these reasons, I encourage this Committee to consider these recommendations in future debates it may have on the Endangered Species Act.

Thank you.

[The prepared statement of Ms. Semcer follows:]

Prepared Statement of

Catherine E. Semcer
Research Fellow
Property and Environment Research Center

US Senate
Committee on Environment and Public Works
Hearing on
Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking

July 22, 2020

Main Points

- Zoonotic disease spillover and the potential for pandemic is a national security threat to the United States.
- Conserving intact wildlands in regions like Africa is essential to preventing such spillover and discouraging the wildlife trafficking that amplifies the risk.
- Chinese companies and consumers remain key players in the degradation of African wildlands and trafficking of African wildlife.
- Longstanding efforts of the Chinese government to decrease involvement of their citizens in these harmful activities have not met with desired levels of effectiveness at the necessary speed.
- The United States must assume a greater leadership role in discouraging the degradation of African wildlands and trafficking of African wildlife. These efforts should ensure that concern for the ability of African partners to conserve ecosystems and field anti-poaching programs are incorporated in the Endangered Species Act decision making and be careful to avoid overreach, such as through blanket bans on the trade and consumption of wildlife.

Introduction

In 2019, the Worldwide Threat Assessment by the U.S. Director of National Intelligence identified pandemic disease as one of the preeminent threats to the security of the United States. The same assessment also identified the illegal trafficking of natural resources by transnational criminal organizations and the degradation of ecosystems as contributing factors to this threat, as well as threats in-and-of themselves.[1]

[1] Office of the Director of National Intelligence. January 29, 2019. Statement for the Record. Worldwide Threat Assessment of the US Intelligence Community. Daniel R. Coats. Director of National Intelligence. Senate Select Committee on Intelligence.

The accuracy of this warning is embodied in the ongoing Covid-19 pandemic, which has claimed 136,938 American lives, made 3.5 million sick,[2] and which the Congressional Budget Office projects will cost our economy upwards of $7.9 trillion over the next decade.[3] While the exact origins of the pandemic are still unknown, U.S. intelligence agencies have expressed a high degree of confidence that those origins are natural,[4] an assessment[5] supported by published, peer-reviewed literature strongly suggesting a genesis in wildlife.[6]

The global tragedy we are witnessing highlights how permeable the line is between our civilization and those parts of the world we deem wild. It also draws into clear focus the inseparability of ecological sustainability and national security. Wildlife-borne pathogens capable of incapacitating millions and shutting down the global economy have shown themselves to already be inside our door. Scientists warn that diseases capable of more far reaching destruction, a "Disease," may await us [7] in the planet's remaining wildlands,[8] areas our civilization has increasing contact with via the pathways created by unsustainable development [9] and the trafficking of wildlife.[10]

Our collective environmental stewardship will determine whether or not the scale of the threat we face from zoonotic disease increases or diminishes. Conserving intact and healthy ecosystems and increasing efforts to curtail wildlife trafficking are key to achieving this goal and should be given increased priority in U.S. foreign policy.

Our country's conservation partnerships in Africa will be key to achieving success. The potential for another pandemic to arise as a result of deforestation, other types of land clearing, or wildlife trafficked out of the continent's wildlands is high. At the same time the opportunity costs for allowing and participating in these activities remain low due to persistent poverty and a lack of individual and community investment in conservation outcomes. These economic and political conditions have encouraged natural resource extraction projects, often backed by Chinese

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[2] US Centers for Disease Control. 2020. Coronavirus Disease 2019. Cases and deaths in the US. Accessed July 17, 2020 at https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/us-cases-deaths.html

[3] Ziv, S. June 2, 2020. Coronavirus Pandemic Will Cost IS Economy $8 Trillion. Forbes

[4] Office of the Director of National Intelligence. April 30, 2020. Intelligence Community Statement on the Origins of Covid-19. ODNI News Release No. 11-20.

[5] Calisher, C., et. al. 2020. Statement in Support of the Scientists, Public Health Professionals, and Medical Professionals of China Combatting Covid-19. The Lancet. 395 e42-e43.

[6] Lau, S.K.P., Hayes, K.H., Antonio, C.P., Kenneth, S.M.L., Longchao, Z., Zirong, H., Fung, J., Tony, T.Y.C., Kitty, S.C.F., and C.Y.W. Patrick. July 2020. Possible Bat Origin of Severe Acute Respiratory Syndrome Coronavirus-2. Emerging Infectious Diseases Journal. 26 (7). US Centers for Disease Control and Prevention. Atlanta, GA.

[7] World Health Organization. 2018 Annual Review of Disease Prioritized Under the Research and Development Blueprint. Informal Consultation. 6-7 February. Geneva, Switzerland. Meeting Report.

[8] Vidal, J. March 18, 2020. Destroyed Habitat Creates the Perfect Conditions for Coronavirus to Emerge: Covid-19 May be Just the Beginning of Mass Pandemics. Scientific American. Ensia.

[9] Faust, C., et. al. 2018. Pathogen Spillover During Land Conversion. Ecology Letters.

[10] T. Wyatt. Autumn 2013. The Security Implications of the Illegal Wildlife Trade. CRIMSOC: The Journal of Social Criminology. Green Criminology Issue.

investment [11], that in many cases are unsustainable, and in some cases, criminal.[12] Despite efforts of the Chinese government to encourage environmentally responsible behavior, Chinese companies and consumers remain key players in both the degradation of African ecosystems and the trafficking of African wildlife. Given the overlap of unsustainable development and source markets for wildlife products with known hotspots and correlates of emerging zoonotic diseases they should be viewed as key propagators of disease risk.

For this reason, the United States should commit to assuming a greater leadership role in supporting efforts to conserve intact wildlands in Africa and maintain or increase the opportunity costs for involvement in poaching. The U.S. Fish and Wildlife Service can play a key role in this endeavor by taking into account the unintended consequences of decisions made under the Endangered Species Act. Considering the impact of listing and importation decisions on the ability of African nations to conserve habitat and field anti-poaching programs would firmly integrate Endangered Species Act enforcement into a "one health" approach, uniting our efforts to protect the environment and prevent future pandemics. Educating U.S. consumers about the environmental and public health costs of products made from African hardwoods manufactured in China can help reduce threats to the Congo Basin, a region whose future is key to our health security.

Finally, while the scale of the threat we face is significant, we must be careful not to overreach with blanket bans on the use of wildlife or by discouraging aspects of wildlife trade that produce great benefits for conservation and public health while generating little risk of disease spillover or transmission. Such overreach is likely to be met with disappointing results and could in fact make the risk of viral spillover greater and disease outbreaks harder to investigate.

The Threat Posed by Zoonotic Disease

In 2018, the World Health Organization began including "Disease X" in its R&D Blueprint for Action to Prevent Pandemics. "Disease X" represents a hypothetical pathogen that could cause a future epidemic or pandemic.[13] Current research suggests that 75 percent of emerging diseases are zoonotic in nature, meaning they originate in animals,[14] and that 60 percent of diseases known to currently occur within the human population are transmitted by animals.[15] For this reason, there is a high degree of probability that Disease X is zoonotic.

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[11] Aryani, R., Ebrahim, N., and X. Weng. 2016. Chinese Investment in Africa's Forests – Scale, Trends, and Future Policies. International Institute for Environment and Development. London, UK.

[12] Anthony, R., Esterhuyse, H., and M. Burgess. 2015. Shifting Security Challenges in the China-Africa Relationship. Policy Insights 23. Foreign Policy Program. South African Institute of International Affairs. Johannesburg, South Africa.

[13] Simpson, S., Kaufmann, M.C., Glozman, V., and A. Chakrabarti. 2020. Disease X: Accelerating the Development of Medical Countermeasures for the Next Pandemic. The Lancet. 20(5).

[14] Taylor LH, Latham SM, Woolhouse ME. Risk factors for human disease emergence. Philos Trans R Soc Lond B Biol Sci. 2001;356:983–9. 10.

[15] Jones KE, Patel N, Levy M, et al. Global trends in emerging infectious diseases. Nature 2008; 451:990-94

Covid-19 fits the description of Disease X, but it is unlikely to be a threat without peer.[16] The number of viruses on our planet is estimated to be more than 10 nonnillion (10^{31}).[17] Mammals, especially bats, rodents, primates, and pangolins are believed to present some of the most significant risk to humans as reservoirs of disease.[18] The number of viruses found in mammals is unknown, but estimated to be more than 1 million, with possibly half of those posing a threat to human health.[19] Some estimate there are more than 300,000 viruses in mammals still awaiting discovery by science.[20] The takeaway is that while the exact scale of the threat of zoonotic viral spillover, the transmission of a pathogen from animal to human, may be unknown, it is likely to be large, and, as the experience of the Covid-19 pandemic illustrates, real.

Such spillovers typically occur along one of the following pathways.[21]

- Human behavior that leads to contact with the animal and the pathogen it is carrying (Excretion)
- Butchering, preparation, and eating of an infected animal (Slaughter)
- Being bitten by an infected animal (Vector borne)

Excretion is the gateway path as the other spillover pathways all involve people coming into contact with an infected animal, it's parts, or its waste.

Examples of vector borne transmission include incidents of simian foamy virus, a relative of HIV, in individuals in Cameroon following severe gorilla bites [22] or a hypothetical future outbreak of Marburg virus, a type of hemorrhagic fever, stemming from a bat bite.[23] For perspective, in Ghana, 66 percent of rural residents surveyed reported being bitten by bats. [24]

Slaughter-based transmission can occur via the informal collection and trade in wild game, also called "bushmeat," and in the commercial sale of the same at so-called "wet markets." One example of this kind of transmission is the 2007 Ebola outbreak in the Occidental Kasai Province in the Democratic Republic of Congo. This outbreak followed the consumption of migrating fruit bats by rural people.[25] Another example is incidences of Simian T-Lymphotropic Virus Type 1

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[16] Settle, J., Diaz, S., Brondizio, E., and P. Daszak. April 27, 2020. Covid-19 Stimulus Measures Must Save Lives, Protect Livelihoods, and Safeguard Nature to Reduce the Risk of Future Pandemics. Intergovernmental Panel on Biodiversity and Ecosystem Services. Bonn, Germany.
[17] Microbiology by the Numbers. 2011. Nature Reviews Microbiology. 9 (628).
[18] Olival, K.J., et. al. 2017. Host and Viral Traits Predict Zoonotic Spillover from Mammals. Nature. 546(7660).
[19] Carlson, C.J., Zipfel, C.M., Garnier, R., and S. Bansal. 2019. Global Estimates of Mammalian Viral Diversity Accounting for Host Sharing. Nature Ecology and Evolution. 3(7).
[20] Anthony, S.J., et. al. 2013. A Strategy to Estimate Unknown Viral Diversity in Mammals. mBio.4(5).
[21] Plowright, R.K., et. al. 2017. Pathways to Zoonotic Spillover. Nature Reviews Microbiology. 15.
[22] Betsem, E., Rua, R., Tortevoye, P., Froment, A., and A. Gessain. 2011. Frequent and Recent Acquisition of Simian Foamy Viruses Through Ape Bites in Central Africa. PLOS Pathogens. 7(10).
[23] Steffen, I., et. al. 2020. Seroreactivity Against Marburg or Related Filoviruses in West and Central Africa. 2020. Emerging Microbes and Infections. 9(1).
[24] Anti, P. et. al. 2015. Human-Bat Interactions in Rural West Africa. Emerging Infectious Diseases. 21(8).
[25] Leroy, E.M., et. al. 2009. Human Ebola Outbreak Resulting From Direct Exposure to Fruit Bats in Luebo, Democratic Republic of Congo, 2007. Vector-Borne and Zoonotic Diseases. 9(6).

strains, which can induce adult T-cell leukemia or lymphoma, in rural Cote d'Ivoire where the consumption of primates is common.[26]

The potential of viral spillover and pandemic to threaten our national security should not be underestimated. The Spanish Flu Pandemic of 1918 killed more Americans than all of the conflicts of the 20th Century combined. Such mortality levels, in addition to related morbidity, is the primary way disease represents a security threat. Widespread death and illness have strong potential to strain America's healthcare system and economic productivity which can help drive political instability and class strife. Pandemic disease can also impair the readiness of our military and destabilize regions of key political and economic importance to the United States [27].

Maintaining Healthy, Intact Ecosystems: The First Line of Defense

Environmental disturbances, such as road building and land clearing can increase the likelihood of viral spillover occurring because they increase opportunities for human contact with wildlife serving as disease reservoirs.[28] Such disturbances can help expand the distance bushmeat hunters and poachers are able to travel into remote areas, increasing the chance of contact with and eventual consumption or trafficking of disease-carrying wildlife.[29] These disturbances also have the potential to increase the density of high risk wildlife, such as bats.[30] For example, recent outbreaks of Ebola Virus in Central and West Africa have shown a strong correlation with deforestation events.[31]

The infrastructure and equipment associated with such disturbances also increases opportunity for wildlife and wildlife products potentially carrying disease to be transported, legally or illegally, from local areas to urban and international markets, thereby increasing the potential for disease outbreaks that are severe in scale.[32] For example, in Cameroon, personnel and trucks associated with logging operations have been documented collecting and transporting bushmeat to markets in Bertoua, Yaounde, and Douala, cities and towns with a combined population of 5.6 million people.[33]

For these reasons, limiting environmental disturbances and keeping remote areas intact via conservation efforts should be viewed as our first line of defense in efforts to decrease the

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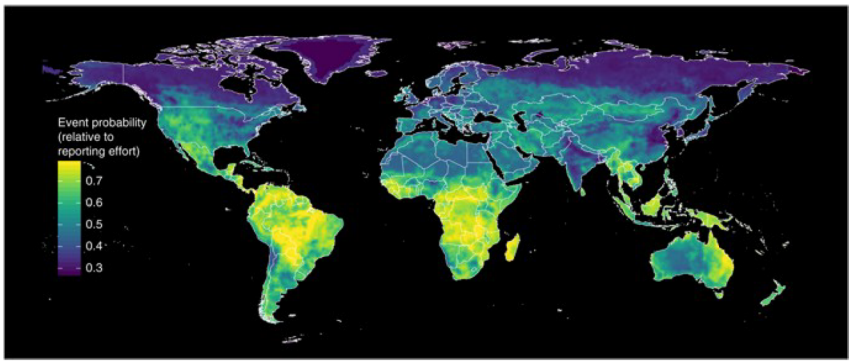
[26] Calvignac-Spencer, S., et. al. 2012. Origin of Human T-Lymphotropic Virus Type 1 in Rural Cote d'Ivoire. Emerging Infectious Diseases. 18(5).
[27] Evans, J. 2010. Pandemics and National Security. Global Security Studies. 1(1).
[28] Johnson, C.K. April 8, 2020. Global Shifts in Mammalian Population Trends Reveal Key Predictors of Virus Spillover Risk. Proceedings of the Royal Society B.
[29] Bausch, DG, and L. Schwarz. 2014. Outbreak of Ebola Virus Disease in Guinea. Where Ecology Meets Economy. PLOS Neglected Tropical Diseases. 8(7).
[30] Rogalski, M.A., et. al. 2017. Human Drivers of Ecological and Evolutionary Dynamics in Emerging and Disappearing Infectious Disease Systems. Philosophical Transactions of the Royal Society. 372(1712).
[31] Olivero, J., et.al. 2017. Recent Loss of Closed Forests is Associated With Ebola Virus Disease Outbreaks. Scientific Reports. 7.
[32] Nishihara, T. 2003. Elephant Poaching and Ivory Trafficking in African Tropical Forests with Special Reference to the Republic of Congo. Pachyderm. 34
[33] Usongo, L. 2003. Preliminary Results on Movements of Radio-Collared Elephant in Lobeke National Park, South East Cameroon. Pachyderm. 34.

potential of any future spillover of a Disease X that can lead to pandemic.[34] Doing so will limit opportunities for contact with disease carrying wildlife in the first place and for high risk wildlife to be trafficked across scales. In course, it will help accomplish the stated objective of the US National Security Strategy to "contain biothreats at their source." [35]

In Sub-Saharan Africa, there is significant overlap between global hotspots and correlates of emerging zoonotic diseases (Fig 1) [36] and intact ecosystems. (Fig 2).[37] There is significantly less overlap between these areas in Africa and designated protected areas where disturbance is legally controlled or restricted (Fig 3). Supporting African nations in decreasing the vulnerability of areas likely to harbor disease carrying wildlife to clearing must be given significantly increased attention in U.S. policies and programs.

Fig 1[38]
Global Hotspots and Correlates of Emerging Zoonotic Diseases



[34] Supra 21.
[35] The White House. December 2017. National Security Strategy of the United States of America. Washington, DC.
[36] Allen, T., et. al. October 24, 2017. Global Hotspots and Correlates of Emerging Zoonotic Diseases. Nature Communications. 8 (1124).
[37] Ibisch, P.L.., Hoffman, M.T., Kreft, S. and G. Pe'er. 2016. A Global Map of Roadless Areas and their Conservation Status. Science. 354 (6318).
[38] Supra 36.

Fig 2[39].
Locations of Remaining Large, Unroaded Areas

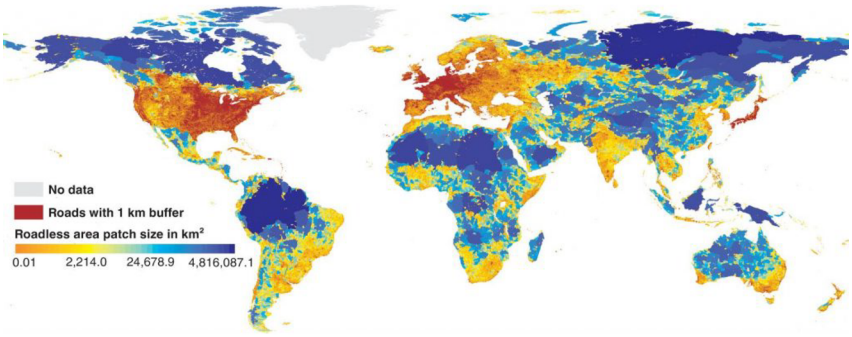
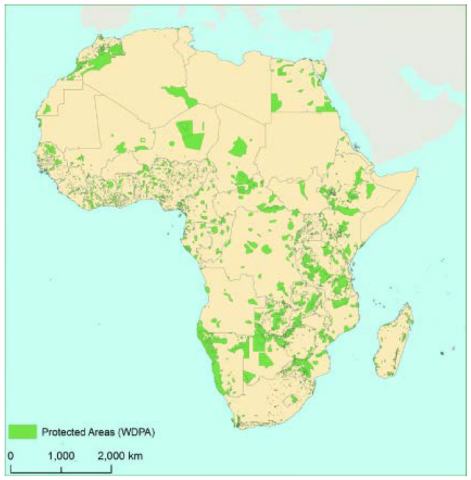


Fig 3[40]
Designated Protected Areas in Africa



[39] Supra 37.
[40] Shennan-Farpon, Y., Burgess, N.D., and F. Danks. 2016. The State of Biodiversity in Africa: A Mid-Term Review of Progress Towards the Aichi Biodiversity Targets. UNEP-WCMC. Cambridge, UK.

Chinese Companies Are a Key Player in the Degradation of African Ecosystems

More than 3 million hectares of forests and other natural habitats in Africa are converted each year. Agriculture and the extraction of timber are primary drivers of this conversion.[41] Increased Chinese investment in Africa's forestry sector, coupled with Chinese consumer demand, as well as consumer demand in the United States, have been influential in encouraging this habitat loss and related risk of disease spillover.

China's Belt and Road Initiative, a government backed, transnational policy and infrastructure project intended to facilitate Chinese global expansion has helped open the door to increased Chinese investment in African forests.[42] Chinese investment in African timber projects now spans at least 24 countries (Fig 4).[43] Most of this investment is via small and medium sized Chinese owned enterprises with no direct ties to the Chinese state.[44] Chinese investment in Africa's forest sector is heavily weighted towards timber extraction and supplying the Chinese market for raw logs of tropical hardwoods, which is the largest in the world.[45] By some estimates, 75 percent of African timber harvested is now exported to China.[46] African forests gained increased importance as a source of wood supply after China banned all commercial logging in its natural forests in 2017.[47]

While the Chinese government has issued voluntary guidelines to encourage environmental safeguards in overseas investment,[48] the lack of official ties between the small and medium sized enterprises in the forestry sector and Beijing, or with Chinese commercial banks, has made accountability to encourage compliance a continuing challenge. This challenge of accountability is exacerbated by relatively weak civil society combined with state control of the media in both China and some African nations.[49] These factors have fostered an environment where it has been easier for Chinese companies and their employees to worsen deforestation and be complicit in criminal activity.

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[41] Supra 39.
[42] Mayers, J. June 19, 2019. China's Investments, Africa's Forests: From Raw Deals to Mutual Gains. International Institute for Environment and Development. London, UK.
[43] Li, B. and Yan, Y. February 11, 2016. How Does China's Growing Overseas Investment Affect Africa's Forests: 5 Things to Know. Global Forest Watch.
[44] Brautigam, D. April 1, 2020. Putting a Dollar Amount on Chinese Loans to Low Income Countries. China Africa Research Initiative. Johns Hopkins School of Advanced International Studies.
[45] Global Witness. 2019. Lesson's From China's Global Forest Footprint: How China Can Rise to a Global Governance Challenge. London, UK.
[46] J. Mayers. June 2015. The dragon and the giraffe: China in African forests. International Institute for Environment and Development. Briefing. London, UK. Accessed July 2, 2020 at https://pubs.iied.org/pdfs/17302IIED.pdf?
[47] Global Times. March, 16, 2017. China Imposes Total Ban on Commercial Logging, Eyes Forest Reserves.
[48] People's Republic of China, Ministry of Commerce. February 18, 2013. Notice of the Ministry of Commerce and the Ministry of Environmental Protection on Issuing the Guidelines for Environmental Protection in Foreign Investment and Cooperation. Shang He Han [2013] No. 74.
[49] Fuller, T.L., et. al. 2018. Assessing the Impact of China's Timber Industry on Congo Basin Land Use Change. Area. Royal Geographical Society. London, UK.

Involvement of Chinese companies in deforestation is illustrated in the countries of the Congo Basin,[50] which contain a history and a high probability of future zoonotic disease spillover.[51] They also are home to a high density of intact forest ecosystems[52]and Chinese timber investment.[53] Three of the countries in the region, - Equatorial Guinea, Cameroon, and Gabon - are among the top five exporters of timber to the Chinese market.[54] Between 2001 and 2015, the export of wood from Congo Basin countries to China doubled, with 50 percent of the exports coming from Cameroon and Republic of Congo.[55] Recent research has shown that the number of logging roads in the Congo Basin has doubled since 2003 within formal logging concessions and increased by more than 40 percent outside of those concessions along with marked increases in

Fig 4[56].

[50] These include: Cameroon, Central African Republic; Democratic Republic of the Congo; Republic of the Congo; Equatorial Guinea; and, Gabon.
[51] Supra 35.
[52] Supra 36.
[53] Putzel, L. et al. 2011. Chinese trade and investment and the forests of the Congo Basin: Synthesis of scoping studies in Cameroon, Democratic Republic of Congo and Gabon. CIFOR Working Paper 67.
[54] Global Witness. April 1, 2019. Lesson's From China's Global Forest Footprint: How China Can Rise to a Global Governance Challenge. London, UK.
[55] Supra 48.
[56] Supra 43.

deforestation. The researchers note that this expansion may increase the vulnerability of wildlife hunted for bushmeat and is concerning for the overall integrity of forest ecosystems.[57]

Deforestation in the Congo Basin has been linked to corruption and criminal activity. A 2019 inquiry by the Environmental Investigation Agency found that that the Dejia Group, a Chinese company operating in Gabon and the Republic of Congo, was linked to bribery, tax evasion, and corruption that led to rigged timber allocations, overharvesting, and the harvesting of protected species.[58]

China is the world's largest consumer of illegal timber[59] and as noted in the 2020 World Wildlife Crime Report released by the United Nations Office on Drugs and Crime earlier this month, Chinese imports of African tropical timber have steadily increased over the past decade, "with a portion of this share suspected to have been illegally sourced or exported." [60] Seizure data from the United Nations World Wildlife Seizure Database indicated that China, along with Vietnam, have been primary destinations for trafficked tropical timber, with three-fourths of all logs seized destined for one of the two countries.[61]

In Gabon, where Chinese companies comprise the largest segment of the timber industry and manage 25 percent of the country's forest area,[62] 30,000 m^3 of logs were exported to China between 2014 and 2018, despite Gabon's ban on raw log exports.[63] A high profile example of this flouting of Gabonese law occurred in 2019, when 392 shipping containers of kevazingo wood, which is generally illegal to harvest in Gabon, were found at depots belonging to Chinese companies at the port of Owendo. Those containers then disappeared from the custody of the Gabonese Department of Justice. The ensuing scandal resulted in the eventual sacking of Gabon's vice-president and forests minister.[64]

It is important to note that while Chinese companies are wholly responsible for their unsustainable practices and involvement in corruption, and criminal activity, U.S. consumers also play a role in driving the loss of healthy and intact forest ecosystems in Africa. The same study that identified increases in the amount of wood being exported from the Congo Basin to China also found that a significant share of this wood was ultimately turned into value added

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[57] Kleinschroth, F., Lporte, N., Laurance, W.F., Goetz, S.J., and J. Ghazoul. June 2019. Road Expansion and Persistence in Forests of the Congo Basin. Nature Sustainability.
[58] Environmental Investigation Agency. 2019. Toxic Trade: Forest Crime in Gabon and the Republic of Congo and Contamination of the US Market. Washington, DC.
[59] Environmental Investigation Agency. 2012. Appetite for Destruction. Report. London, UK.
[60] United Nations Office on Drugs and Crime. 2020. World Wildlife Crime Report: Trafficking in Protected Species. Vienna, Austria.

[61] Supra 58.
[62] Yoan, A.O., Xue, Y., and M.J.M. Kiki. 2018. Gabon Wood Industry and Chinese Company Activities. Open Access Library Journal. 5.
[63] Environmental Investigation Agency. 2018. African Log Bans Matter: Reforming Chinese Investment and Trade in Africa's Forest Sector. Washington, DC.
[64] Reuters. May 22, 2019. Gabon President Fires VP, Forests Minister Over Hardwoods Scandal.

products, like furniture, to meet U.S. demand.[65] More specifically, the Environmental Investigation Agency's expose of the Dejia Group's activities revealed them to be a major supplier of tropical timber to US markets and contaminator of the US wood products supply chain.[66]

Stopping the Spread by Combating Wildlife Trafficking

Because they require a potentially diseased animal being removed from their natural habitat, incidents of wildlife trafficking represent a potential failure to contain biothreats at their source. Wildlife trafficking, especially for species such as pangolins and birds, amplifies the risk of viral spillover and pandemic as a result of disease carrying wildlife being handled by multiple people across multiple countries.[67] The poor sanitary conditions under which wildlife are often trafficked increases the risk of disease spread and the criminal nature of trafficked wildlife means it bypasses veterinary and health inspections required of legal wildlife trade.[68]

Because of the relationships between wildlife trafficking, pandemic disease, and transnational organized crime it has been recognized as a national security threat since 2013 and the signing of Executive Order 13648.[69] The US commitment to responding to this threat has been further enshrined in the National Strategy for Combating Wildlife Trafficking,[70] legislation such as the Eliminate, Neutralize, and Disrupt Wildlife Trafficking Act,[71] and in programs spanning the Department of Interior[72] and US Fish and Wildlife Service,[73], Department of Homeland Security[74], USAID[75], as well as Departments of State,[76] and Defense.[77]

Chinese Criminals Continue to Supply Chinese Consumers with Illicit Wildlife Products

Wildlife trafficking is a global challenge with involvement from actors in nearly every country.[78] Increased regional connectivity, such as through China's Belt and Road Initiative, has led to

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[65] Supra 48.
[66] Supra 63
[67] Huong, N.Q., et. al. 2020. Coronavirus Testing Indicates Transmission Risk Along Wildlife Supply Chains for Human Consumption in Vietnam, 2013-2014.BioRxiv.
[68] Karesh, W.B., Cook, R.A., Bennett, E.L., and Newcomb, J. 2005. Wildlife Trade and Global Disease Emergence. Emerging Infectious Diseases.
[69] 3 CFR 13648 – Executive Order 13648 of July 1, 2013. Combating Wildlife Trafficking.
[70] The White House. February 11, 2014. National Strategy for Combating Wildlife Trafficking. Washington, DC.
[71] P.L. 114-231.
[72] US Department of the Interior. Undated. Combating Wildlife Trafficking Worldwide. Factsheet. US Department of the Interior, International Technical Assistance Program. Washington, DC.
[73] US Fish and Wildlife Service. 2018. Combating Wildlife Trafficking Program, FY 2018 Summary of Projects. US Department of the Interior, Fish and Wildlife Service, Division of Management Authority. Arlington, VA.
[74] US Department of Homeland Security, Undersecretary for Management. 2018. Illegal Trafficking of Wildlife and Other Natural Resources, FY 2018 Report to Congress. Washington, DC.
[75] US Agency for International Development. 2019. Countering Wildlife Crime. Factsheet. US Agency for International Development, Environment Office, Kenya/East Africa. Nairobi, Kenya.
[76] US Department of State, Bureau of Oceans, Environment and Science. 2019. 2019 END Wildlife Trafficking Report to Congress. US Department of State, Washington, DC.
[77] Summers, E. September 23, 2016. US Soldiers Team with Tanzania Rangers to Combat Poaching. US Army.
[78] Supra 58.

growing concern[79] among conservationists that linkages created by this initiative and others may create new pathways that can be exploited by wildlife traffickers[80] unless mitigated by policy and practice. While the Chinese government has adopted well publicized policies, and hosted public forums for their expatriate nationals[81] with the intent of curtailing Chinese involvement in wildlife trafficking, applauded African nations' arrest and prosecution of Chinese nationals involved in wildlife trafficking[82] and enacted penalties of between 5 and 10 years in prison for wildlife trafficking offenses, [83] achieving the desired level of success remains an ongoing process.

China has historically been a leading consumer market for wildlife products, including those sourced and imported illegally. This includes products such as elephant ivory, a traditional status symbol, as well as rhino horn and pangolins used in traditional Chinese medicine. China's efforts to curtail illicit trade in wildlife goes back to 1993 when it banned the trade in rhino horn.[84] In response to international pressure stemming from an African elephant poaching crisis that began in 2008,[85] the Chinese government banned the purchasing and selling of ivory in the country in 2017.[86] Following the outbreak of Covid-19 in the city Wuhan, a ban was also enacted on the consumption of pangolin meat and use of pangolin scales for medicinal purposes.[87]

Recent analysis and events however show that laws are easier to change than behavior. While domestic consumption of ivory has stabilized in China, a recent report from the World Wildlife Fund found that for those Chinese who can afford to travel abroad, consumption of ivory increased 10 percent between 2018 and 2019.[88] The 2020 World Wildlife Crime Report issued by the United Nations stated that China remains a leading destination market for seized rhino horns and that Chinese nationals comprise the single largest known group of individuals arrested for rhino horn trafficking. Seizure data also reveals that China is the leading destination for pangolin shipments.[89]

As with deforestation, Chinese involvement in the trafficking of wildlife from Africa often takes the form of individuals involved in the more than 10,000 [90] small and medium sized Chinese

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[79] Hughes, A.C. 2019. Understanding and Minimizing the Environmental Impacts of the Belt and Road initiative. Conservation Biology. 33(4).
[80] Farhadinia, M.S., et. al. Belt and Road Initiative May Create new Supplies for Illegal Wildlife Trade in Large Carnivores. August 12, 2019. Nature Ecology and Evolution.
[81] Hongjie, L. march 26, 2019. China Calls on Citizens in Africa: Stop Wildlife Trafficking. China Daily.
[82] Chen, L. February 20, 2019. Beijing Backs Jail Term for Chinese Ivory Queen Yang Fenglan in Tanzania. South China Morning Post.
[83] Criminal Law of the Peoples Republic of China. Art. 341.
[84] Wudunn, S. June 6, 1993. Beijing Bans Trade in Rhino and Tiger Parts. The New York Times. Pp. 19.
[85] Convention on International Trade in Endangered Species. March 3, 2016. African Elephants Still in Decline Due to High Levels of Poaching. Press Release. Geneva, Switzerland.
[86] Agency France-Presse. December 31, 2017. China Imposes Total Ban on Elephant Ivory Sales.
[87] Westcott, B. June 10, 2020. China Removes Pangolin Scales From Traditional Medicine List, Helping Protect the World's Most Trafficked Mammal. CNN.com.
[88] World Wildlife Fund. 2019. Demand Under the Ban: China Ivory Consumption Research 2019. Beijing, China.
[89] Supra 89.
[90] Yuan-Sun, I., Jayaram, K., and O. Kassiri. 2017. Dance of the Lions and Dragons: How are Africa and China Engaging and How Will the partnership Evolve? McKinsey and Company. Chicago, IL.

enterprises across the continent not controlled by the Chinese state. In Gabon individuals involved in these enterprises have been identified as middlemen in the trafficking of pangolins.[91] Highly publicized criminal cases such as that of Yang Feng in Tanzania, who in addition to being a restaurateur served as Vice-President of the China-Africa Business Council [92], have brought into sharper focus the role of some of these businesses as fronts for wildlife trafficking operations.[93]

Conclusion

Past efforts to curtail illicit wildlife trafficking and its related health and security risks have relied heavily on the actions of the Chinese government and on ending Chinese consumer demand for wildlife products. These efforts reach back more than 25 years. While the Chinese government has taken notable steps to advance the global interest in ensuring that trade in wildlife is legal and safe, the recent United Nations World Wildlife Crime Report makes clear that these efforts have not been sufficient or proceeded at the pace required. This is especially true in regard to the trafficking of pangolins which present a high risk of viral spillover and possible pandemic. The United States, through the programs of the U.S. Fish and Wildlife Service and other agencies must take an increased leadership role in efforts to secure global health by conserving ecosystems and curtailing wildlife trafficking, especially in and from Africa.

Recommendations

1. **Support Wildland Conservation in Africa Via the Endangered Species Act**

   Species listing and import permitting decisions under the Endangered Species Act could produce wider benefits for conservation and health security if they were required to assess their impact on the ability of African nations to conserve intact ecosystems. Currently these decisions can create significant financial instability in Africa's safari hunting industry by creating barriers and obstacles to the importation of hunting trophies into the U.S. and discouraging U.S. citizens from hunting in Africa. This can adversely impact ecosystem conservation by removing the economic incentives that make this conservation possible.

   More than 20 African nations currently allow the safari hunting industry to operate within their borders. Public, communal, and private hunting areas in Sub-Saharan Africa are estimated to conserve approximately 344 million acres of wildlife habitat, an area more than four times the size of the US national park system.[94]

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[91] Mambeya, M.M., et. al. 2018. The Emergence of Commercial Trade in Pangolins from Gabon. African Journal of Ecology. 56(3).
[92] Sieff, K. October 8, 2015. Prosecutors Say This 66-Year-Old Chinese Woman is One of Africa's Most Notorious Smugglers. The Washington Post.
[93] Tremblay, S. April 7, 2019. Chinese "Queen of Ivory" Jailed for 15 Years in Tanzania. CNN.com
[94] PERC analysis

The economic incentives to conserve habitat at this scale take various forms including revenue-sharing agreements with rural communities and direct payments to private landowners. For example, in Zimbabwe, under the Communal Areas Management Program for Indigenous Resources (CAMPFIRE), rural communities lease hunting and other tourism rights to commercial outfitters. The communities are then paid 50 percent of the revenues generated by the tourism activity.

This arrangement has incentivized the conservation of 12 million acres of wildlife habitat in Zimbabwe. Safari hunting accounts for 90 percent of the revenues raised, which totaled approximately $11.4 million between 2010 and 2015. Elephant hunting provides 65 percent of these revenues, with 53 percent of those coming from American hunters.[95]

In South Africa, where almost all of the land is in private ownership, access to the US hunting market has created incentives for farmers and ranchers to convert agricultural lands back into wildlife habitat. At present, approximately 50 million acres of private ranchlands in South Africa are being primarily managed for wildlife and ecosystem health.

It has been argued that these incentives and revenues could be replaced with photo-tourism, but the available research shows that while the two industries are mutually supportive, they are rarely interchangeable. Analysis conducted in Botswana concluded that hunting was the only economically viable wildlife-dependent land use on two-thirds of the country's wildlife estate.[96] Other researchers have concluded that only 22 percent of the country's Northern Conservation Zone has intermediate to high potential for photo-tourism.[97]

A 2016 study published in Conservation Biology also determined that if hunting were removed from the uses available to wildlife conservancies in Namibia, 84 percent of them would become financially insolvent. This insolvency would place an area of habitat five times the size of Yosemite National Park at risk. The same study also found that if photo-tourism was removed as a revenue stream, only 59 percent of wildlife conservancies would remain economically viable.[98]

Researchers with the University of Pretoria have determining that if just lion hunting were to end in the nations of Mozambique, Tanzania, and Zambia 15 million acres of wildlife habitat managed as hunting blocks would see decreased economic viability as wildlife habitat and increased vulnerability to land clearing.[99] More recent research conducted in South Africa found that 63 percent of the country's private wildlife

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[95] CAMPFIRE Association. 2016. The Role of Trophy Hunting in Support of the Zimbabwe CAMPFIRE Program. CAMPFRE Association. Harare, Zimbabwe

[96] Barnes, J. 2001. Economic Returns and Allocation of Resources in the Wildlife Sector of Botswana. South African Journal of Wildlife Research. 31: 141-153

[97] Winterbach, C.W., Whitesell, C. and M.J. Somers. 2015. Wildlife Abundance and Diversity As Indicators of Tourism Potential in Northern Botswana. PLoS One. 10.

[98] Naidoo, R., Weaver, L.C., Diggle, R.W., Matongo, G., Stuart-Hill, G. and C. Thouless. 2016. Complimentary Benefits of Tourism and Hunting to Communal Conservancies in Namibia. Conservation Biology. 30:3

[99] Supra 72.

conservancies could be at increased risk due to increased restrictions on the trade in African hunting trophies.[100]

Taking these kinds of considerations into Endangered Species Act decision making will allow for it to be an asset in efforts to secure global health rather than a potential liability.

2. Educate US Consumers About the Environmental and Public Health Costs of Products Made from African Hardwoods

Conservation of healthy, intact ecosystems in places like the Congo Basin depends on reduced US demand for tropical wood products manufactured in China. The U.S. Fish and Wildlife Service should engage in a public educational campaign informing U.S. consumers about the costs of tropical wood products from China to African wildlife and health security. Such a campaign could be modeled on previous awareness raising efforts, such as for illegal ivory.

3. Support African Anti-Poaching Efforts via the Endangered Species Act

Wildlife trafficking begins with poaching, the illegal, uncontrolled, and unmonitored killing or capturing of wildlife. Species listing and import permitting decisions under the Endangered Species Act could produce wider benefits for conservation and health security if they were required to assess their impact on the ability of African nations to support anti-poaching programs.

Like ecosystem conservation, anti-poaching programs in Africa can be heavily reliant on the safari hunting industry which is at risk of destabilization by Endangered Species Act decisions that result in obstacles and barriers to the importation of hunting trophies into the U.S. and discourage U.S. citizens from hunting in Africa. For example, historically all of the anti-poaching activities conducted by the Tanzania Wildlife Management Authority have been funded by revenues gained via safari hunting licenses and fees. Similarly the Zimbabwe Parks and Wildlife Management Authority, the country's primary wildlife law enforcement authority, generates 30 percent of its total operating revenue from safari hunting licenses and fees.[101] These national law enforcement authorities also often benefit from anti-poaching patrols funded by safari hunting operators that act as a force multiplier.[102]

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[100] Parker, K., et. al. 2020. Impacts of a Trophy Hunting Ban on Private Land Conservation in South African Biodiversity Hotspots. Conservation Science and Practice.

[101] Tendaupenyu, I.H. June 24, 2014. Statement Before the U.S. House of Representatives, Committee on Natural Resources, Subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs. Oversight Hearing on The U.S. Fish and Wildlife Service's Plan to Implement a Ban on the Commercial Trade in Elephant Ivory. Serial No. 113-76.

[102] Lindsey, P. 2008. Trophy Hunting in Sub-Saharan Africa: Economic Scale and Conservation Significance. In, Baldus, R., Damm, G.R., and K. Wollscheid (eds): Best Practices in Sustainable Hunting: A Guide to Best Practices Around the World. CIC Technical Series Publication 1. CIC and UN Food and Agriculture Organization. Pp. 41-47.

Considering the potential impact of Endangered Species Act decisions on the ability of African nations to financially support anti-poaching programs can help ensure that key gaps in wildlife law enforcement do not develop, that poaching is discouraged, and that trafficked wildlife is interdicted as close to the source as possible, thereby decreasing the risk of it spreading disease.

4. Don't Overreach

It is important that policy and program responses seeking to reduce the risk of viral spillover and pandemic not overreach. For example, calls for blanket bans on wildlife trade and the consumption of wildlife, as through so called wet markets" are likely to see little success, may increase the risk of viral spillover, and frustrate future efforts to track any outbreaks.

In Central Africa alone it is estimated that > 1 billion kg of wild game meat[103] from an estimated 579 million animals[104] is consumed each year. This consumption is as much a factor of necessity as it is culture. Past bans on bushmeat consumption following outbreaks of Ebola[105] only served to drive trade and consumption underground. A similar experience was had in China following the outbreak of Covid-19. [106] Increased informality and decreased visibility of markets risks degrading sanitary conditions and increasing the likelihood of zoonotic disease outbreak along with the involvement of criminal elements. This would likely frustrate efforts to investigate disease outbreaks should they occur. The creation of black markets and related rise in prices may also increase incentives for poaching.

Similarly, suggestions that banning or further restricting the importation of African hunting trophies would serve public health are unfounded and would have unintended, negative consequences. Hunting trophies already are subject to rigorous customs regulations that help insure they are safe for importation and there has never been a documented case of a hunting trophy of an African game species being the source of a disease outbreak in the United States. As per the discussion of my other recommendations, such bans would only likely lead to decreased capacity and capability in Africa to maintain healthy ecosystems and combat poaching thereby increasing risks to public health.

Thank you.

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[103] WIlkie, DS, and JF Carpenter. 1999 Bushmeat Hunting in the Congo Basin: An Assessment of Impacts and Options for Mitigation. Biodiversity Conservation. 8.

[104] Peres, Fa JE. 2003. Game Vertebrate Extraction in African Neotropical Forests: An Intercontinental Comparison. In Reynolds, JD, Mace, GM, Redford, KH, and JG, Robinson, eds. Conservation of Exploited Species. Cambridge. Cambridge University Press. P. 203-241.

[105] Bonwitt, J., et. al. 2018. Unintended Consequences of the "Bushmeat Ban" in West Africa During the 2013-2016 Ebola Virus Disease Epidemic. Social Science and Medicine. 200.

[106] Standaert, M. march 24, 2020. Illegal Wildlife Trade Goes Online as China Shuts Down Markets. Al Jazeera.

Senate Committee on Environment and Public Works
Hearing entitled, *"Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking"*
July 22, 2020
Questions for the Record for Catherine Semcer

Senator Carper:

1. **A large body of scientific evidence suggests that both habitat loss and fragmentation are contributing to the potential for transmission of zoonotic diseases.**
   a. **As our Committee considers the impacts of wildlife trafficking on the spread of zoonotic disease, do you agree that we should also consider the impacts of habitat loss?**

      The impacts of habitat loss should be a priority for the Committee as it seeks to reduce the risks posed by zoonotic disease. Conserving intact, healthy ecosystems, especially in regions that are hotspots, or with a high degree of correlation with emerging zoonotic diseases, is our first line of defense in preventing these diseases from spilling over into the human population.

      By limiting the extent to which people can intrude into remote areas, and the ease with which disease carrying wildlife can be trafficked, or otherwise transported. out of such areas, we reduce the likelihood of people and disease carrying wildlife coming into contact. While efforts to curtail wildlife trafficking further down the supply chain are essential they also are, with regard to public health, akin to chasing a horse that has already left the barn. Conserving intact, healthy ecosystems is how we keep the barn doors shut.

   b. **What steps could our Committee and the Congress take to address this part of the problem?**

      Improving the Endangered Species Act, so that agency decisions consider the potential impact of listing and importation decisions on the ability of foreign countries to fund or incentivize the conservation of intact, healthy ecosystems would help achieve this objective, especially in Africa. The listing of African game species under the Endangered Species Act, especially when applied indiscriminately, has a track record of undermining the sustainable hunting programs that African nations use as the primary source of funding and economic justification for their conservation efforts. While species listings under the ESA may sometimes be required, decisions should be made with full awareness of what potential negative consequences they might have for ecosystem conservation so that strategies and programs to mitigate those consequences can be developed, funded, and deployed.

For example, the listing of African lion, and related hunting trophy import restrictions, led one hunting operator in Tanzania to surrender 6 million acres of hunting leases because he could no longer turn enough profit to stay in business. This surrender resulted in these hunting areas being abandoned and there is increasing evidence that some of them are being cleared for agriculture, increasing the risk of zoonotic disease spillover. The surrender also resulted in the disbanding of a 150 man anti-poaching unit that was funded by the operator, removing a large scale force multiplier for the Tanzania Wildlife Management Authority, and creating a gap in Tanzania's ability to stop poaching and interdict trafficked wildlife. Such situations, especially if allowed to multiply across the region increase the challenge of containing zoonotic diseases at or close to their source.

Congress should also consider the potential value of strategically forgiving debt to key nations in exchange for those nation's commitment to conserve intact, healthy ecosystems. Commitments should be sought to conserve areas from where there is a high likelihood of future outbreaks and pandemics emerging. Such debt for nature swaps can help reduce the risk of future public health crises, strengthen ties between the United States and countries in Africa and elsewhere, and aid the economic recovery of emerging markets so that poverty levels do not backslide and exacerbate public health risks.

2. **To address zoonotic diseases in wildlife, southeastern states established the Southeastern Cooperative Wildlife Disease Study at the University of Georgia. Northeastern states launched a similar effort at the University of Pennsylvania.**
   a. **Could a national network of regional wildlife disease cooperatives improve the U.S. response to zoonotic diseases?**

      I believe it could. The Covid-19 pandemic highlights to the importance of coordination between and across governments to address threats to our safety and security. The central nature of state governments in our nation's public health infrastructure makes states the logical organizing nexus for such cooperatives.

      However, it is important that these cooperatives not be limited in their effectiveness due to limitations in participation and funding. Cooperatives should represent fusions of relevant agencies, interests, and capabilities beyond the wildlife and related medical professions, and include participation from public health, healthcare providers, the national guard, and others whose expertise and resources are called upon after zoonotic diseases spillover. The key is to not just understand known wildlife diseases but to anticipate public health crisis stemming from wildlife diseases in a way that allows for those crises to be prevented, and to be effectively addressed if prevention proves impossible.

Senator BARRASSO. Thanks so much for your very thoughtful testimony. We appreciate it.

We are now going to head to Long Island, New York.

Dr. Epstein, I appreciate you taking the time to join us. I know that you were prepared to come and visit us today, but based on issues that relate to returning to New York and a 14-day mandatory quarantine, we understand your reasons to want to stay on Long Island, but thank you very much for joining us today, Doctor.

STATEMENT OF JONATHAN H. EPSTEIN, VICE PRESIDENT FOR SCIENCE AND OUTREACH, ECOHEALTH ALLIANCE

Mr. EPSTEIN. Thank you, Senator Barrasso, and thank you very much for the invitation. I particularly appreciate the Committee's flexibility in allowing me to testify remotely.

I would also like to thank Ranking Member Carper and members of the Committee for holding this important hearing today.

My name is Dr. Jon Epstein. I am the Vice President for Science and Outreach at EcoHealth Alliance, which is a science based nonprofit located in New York City.

For those of you who are unfamiliar, EcoHealth Alliance works globally with partners around the world to study the relationships between human and animal health and human activities that drive the emergence of new diseases, ultimately with the intention and effort to stop epidemics from happening.

As was mentioned earlier, and I think you set the stage very nicely for this conversation, the majority of emerging diseases are zoonotic, and about three-quarters of them come from wildlife, so wildlife play an incredibly important role in our health. Diseases like the 1918 influenza, which originated in migratory waterfowl; HIV which originated in chimpanzees and other primates; SARS coronavirus, which was natural reservoirs, or bats; and now SARS-CoV-2, the virus responsible for COVID-19, which likely also has an origin in bats.

However, it is important to mention that it is not the fact that wildlife carry disease, rather that it is human activities that increase our interaction with wildlife that drives disease emergence. So the global wildlife trade becomes very important. As we know, it is a complex and far reaching multi-billion dollar industry, transporting live animals and animal parts locally and globally for food, medicine, pets, clothing, and ornaments.

As mentioned, there are two facets to the wildlife trade that are both legal and illicit components; the latter, which is second really only to guns and narcotics in scale, and perpetrated by criminal and organized networks.

In general though, whether legal or illicit, the wildlife trade increases risk of zoonotic disease emergence by bringing people and wildlife into closer and more frequent contact, beginning in local communities during the process of capturing animals, and ends with transport to wildlife markets, which may involve multiple species being carried together and intermingling. Then there is handling and butchering of animals, particularly in live animal markets.

There is spillover risk at every stage. The opportunity for viruses or bacteria that are carried naturally by wild animals to make

their way from those natural hosts into either other animal species or into people. It is particularly risky in crowded, urban wet markets, as was the case with SARS back in 2002, which emerged in southern China, which gave the virus an opportunity to spread inside the market among different animals species, and then ultimately into people, before it made its way internationally through travel.

Although wet markets are common in southern China, the reality is they exist all over the world. They are not unique to China, specifically, though the risks are similar wherever they look. Nearly every country in the world is involved in wildlife trade in one form or another.

In the United States and the global community, we continue to be vulnerable to zoonotic disease outbreaks, because there is a lack of effective surveillance for zoonotic viruses in wildlife, livestock, and people, particularly in the parts of the world that are most at risk for disease emergence, which inhibits our ability to rapidly detect and contain an outbreak while it is still localized, and before wider spread through travel can occur.

I thought it would be helpful to briefly discuss a study that we published, that EcoHealth Alliance published back in 2017, and I am just going to share my screen briefly and put an image up that I think many of you have in your briefing packets or hopefully can see in the room.

Is this map visible?

Senator BARRASSO. Yes, very clear, thank you very much.

Mr. EPSTEIN. OK, great. This comes from a study that looks at the drivers, or the factors that cause disease emergence, particularly zoonotic disease emergence. What you are looking at is a global hot spots map, which is really a map showing parts of the world that are particularly vulnerable to zoonotic disease emergence. The areas that are more yellow are higher risk.

This is a statistical analysis, a predictive analysis, that looks at things like biodiversity, species richness, human demography, livestock production, and dynamic processes that influence how we contact wildlife, like land use change. That can be deforestation or land conversion to agricultural land or urbanization.

What you will notice is that, well, two things. One is, we now scientifically now have a good understanding of where in the world we are likely to continue to see epidemics begin, based on these risk factors.

Second, many of these areas around the world also overlap with wildlife trafficking hubs or origins. Parts of Asia, parts of Africa, and parts of the Americas, which to no surprise, particularly are areas where there is a lot of species richness and biodiversity, which tend to be sources for the wildlife trade.

All that is to say that we know where to focus resources, both in terms of stopping pandemics from happening locally, but also understanding better some of the drivers that cause them.

The last thing I wanted to mention was that imported exotic animals and smuggled bushmeat increases the risk of disease introduction to the United States.

A 2010 GAO report from the Department of Homeland Security and Government Affairs identified gaps in our ability to detect

zoonotic pathogens in imported animals, due to a lack of coordination among Federal health agencies and the absence of a single agency responsible for screening live animal imports for zoonotic agents.

The report called for greater cooperation among Federal agencies including the U.S. Fish and Wildlife Service, and cited the value of public-private partnerships with NGOs and universities helping to fill these gaps.

Today, these issues still remain, and there is an opportunity for this Committee to expand the scope of the U.S. Fish and Wildlife Service to lead disease surveillance on imported wildlife, working in concert with the CDC, the Center for Disease Control and Prevention, the U.S. Department of Agriculture, and the USGS National Wildlife Health Center. This would significantly strengthen our capacity to detect zoonotic viruses at the U.S. border and possibly in other countries as part of a pre-border surveillance program.

I look forward to the opportunity to discuss specific ideas about the U.S. Fish and Wildlife's involvement in disease surveillance in the course of today's hearing, and to answer any questions that the Committee may have.

Thank you very much.

[The prepared statement of Mr. Epstein follows:]

Senate Committee on Environment and Public Works

Senate Hearing on
"Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking"

Testimony of Jonathan Epstein DVM, MPH, PhD
Vice President for Science and Outreach
EcoHealth Alliance
July 22nd, 2020

EcoHealth Alliance
520 Eighth Avenue, Ste. 1200
New York, NY 10018
212.380.4460
EcoHealthAlliance.org

Introduction

Good morning. My name is Dr Jonathan Epstein from EcoHealth Alliance. Thank you Chairman Barrasso and Ranking Member Carper for inviting me to speak before this committee on the important issue of the wildlife trade and trafficking as a cause of epidemics. Today I plan to speak about how viruses emerge from wildlife to cause epidemics in people and how the wildlife trade and trafficking play a role in disease emergence. My testimony will be in three parts and will include a review of the science behind zoonotic disease emergence – diseases that originate in animals and jump into human populations; giving examples of recent epidemics caused by animal viruses. The second part will describe how the wildlife trade and trafficking, both locally and globally, can increase the risk of viruses jumping from animal hosts into people and causing epidemics. In the third part of my testimony I'll review some of the agencies that work on wildlife disease surveillance, and discuss the important role that US Fish and Wildlife Service can play in preventing epidemics both domestically and internationally. I'll discuss gaps that have been identified with respect to the United States' capacity to screen imported wildlife for zoonotic diseases and some ideas for how the US Fish and Wildlife Service may play a greater role in preventing pandemics internationally as it works with partner countries to combat wildlife trafficking. These are matters that my colleagues and I at EcoHealth Alliance have been working on for more than two decades, and I am grateful for the opportunity to discuss them today.

Part One: The emergence of zoonotic diseases from wildlife

More than half of known human diseases are zoonotic, meaning that they are caused by viruses, bacteria, or other disease-causing micro-organisms ("pathogens") that occur naturally in animals. There are many examples of significant zoonotic pathogens that have led to large scale epidemics or global pandemics. Among them are HIV, which originated in chimpanzees and other primates; pandemic influenza viruses (1918, 2009) which originated in migratory waterfowl; SARS coronavirus, which comes from bats, and Ebola virus, also believed to come from bats (1). Some epidemics are caused by zoonotic bacteria, such as Plague, which is carried by rodents. In addition to threatening human health, many of these pathogens can also infect other animals causing disease and death, threatening endangered wildlife species and livestock which are vital for human livelihood. Diseases that are newly recognized, that have recently jumped from native animal hosts to livestock or people, or that have expanded their geographic range are referred to as "emerging" diseases. These tend to be caused by viruses, but may also include bacteria such as antimicrobial resistant bacteria. 75% of emerging diseases are zoonotic, and the majority of these come from wildlife, including the viruses mentioned above(2). In most cases, we do not have drugs or vaccines readily available to protect us from emerging diseases, and so our best tool for protecting human and livestock populations from emerging zoonotic pathogens is preventing transmission from wildlife in the first place.

EcoHealth Alliance
520 Eighth Avenue, Ste. 1200
New York, NY 10018
212.380.4460
EcoHealthAlliance.org

EcoHealth Alliance

EcoHealth Alliance is well known for its scientific research that has helped identify the underlying causes of epidemics. We have shown that zoonotic diseases primarily emerge through human activities that increase human or domestic animal contact with wildlife. Land-use change (e.g. deforestation, agricultural land expansion) is the most significant among the various drivers of disease emergence that have been identified, causing about 30% of emerging diseases (3). Other drivers include intensive livestock farming where domestic and wild animals comingle, bushmeat hunting, wildlife trade (e.g. extracting animals from the wild to supply markets) and global travel. With increased contact among people, domestic animals (e.g. cattle, poultry, goats, etc…) and wildlife, there is increased opportunity for viruses to jump from one species to another, a process called "spillover." Given the right type of virus, it may then cause disease in the new hosts in infects, and potentially spread among animals or people. If a virus is able to be transmitted from person to person, local community spread occurs. Human mobility and connectivity then allows new populations to be infected and can lead to larger epidemics. International travel has connected the world more than ever before, which allows local epidemics to quickly become global pandemics (4). Examples of emerging viruses and the human activities that allows spillover to occur include: HIV, which jumped from chimpanzees and other non-human primates through hunting and butchering, which exposed people to bodily fluids from animals; Nipah virus, which jumped from fruit bats to pigs and then to people in Malaysia via intensive pig farming and the presence of orchards on farms which attracted bats and allowed pigs to eat dropped fruit contaminated with bat excreta. SARS coronavirus emerged through the wildlife trade in southern China as live bats, civets, and other mammals were brought into large urban markets and butchered, exposing vendors to bodily fluids of infected animals (1).

Human demography and wildlife biodiversity are strong predictors of disease emergence, and there are specific geographies that have been identified as high risk for disease emergence, termed "EID hotspots," based on these and other factors including climate and latitude. **Figure 1** shows a map of global EID hotspots, places where zoonotic disease outbreaks are most likely to occur in the future. Because they tend to be rich in biodiversity, many EID hotspots are also hotspots for wildlife trade and trafficking.

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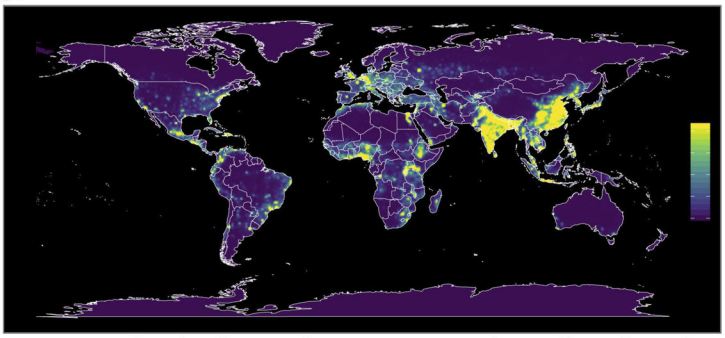

Figure 1. Map of predicted hostpots for emerging zoonotic diseases (from Allen et al., *Nat. Comm*. 2017)

Part Two: Wildlife trade and trafficking drives zoonotic disease emergence.

The wildlife trade and trafficking are drivers of zoonotic disease emergence. Wildlife trade is a broad term that includes several ways in which people utilize wildlife. Generally, people utilize wildlife for food, clothing, pets, ornaments, and medicine (5). The extent to which people use wildlife varies by geography and culture. Hunting wildlife for food occurs around the world, including the United States, and wildlife hunting can be for subsistence or done on a more commercial scale to supply local, regional, or international markets. The value chain, or the process by which animals are removed from wild populations and transported as a commodity within a market system, can serve as an amplifier of risk for disease emergence.

The global wildlife trade is massive, complex, and includes nearly every country in the world (6). It consists of live animals and animal parts that are sold for food (e.g. bushmeat), medicinal purposes, ornamental purposes, and pets. Wildlife trade and trafficking threatens both conservation and human health (7, 8). Whether legal or illegal, the process of harvesting animals from natural habitats and transporting them around the world can create risk of disease transmission. China and the United States are the world's biggest consumers of wildlife, with China primarily using wildlife for food and traditional medicine while the US imports are driven by commercial uses including the exotic pet trade (5). The global wildlife trade is composed of both legal and illegal elements, the latter of which represents tens of billions of dollars and is often conducted by organized criminal entities (6). An analysis of legally imported wildlife into the United States between 2000 and 2005 conducted by EcoHealth Alliance using the US Fish and Wildlife's Law Enforcement Management Information System (LEMIS) database, found that many mammals known carry zoonotic viruses and bacteria were imported for commercial purposes, including various primate and rodent species (9). The legal importation of macaques from the

Philippines for biomedical use in 1990 introduced Ebola virus (now called "Reston ebolavirus") into the United States (10).

We are just beginning to understand the extent to which various wildlife species may carry zoonotic viruses, and in general, our work has shown that we are only aware of about 1% of the predicted total viruses that exist in nature (11). Each species of animal has its own particular microbial flora, which includes bacteria and viruses. Most of these are benign, or beneficial to the animal – the result of evolutionary relationships between host and microbe. A small proportion of viruses may have the ability to infect other animal or human hosts, and cause disease. This pool of zoonotic viruses in wildlife has yet to be fully studied, though efforts to do so such as EcoHealth Alliance's work under the US Agency for International Development's PREDICT project, which discovered more than 900 novel viruses in wildlife across 25 countries, including from illegally trafficked animals, have improved our understanding of the diversity of viruses carried by animals considered to be important hosts, such as bats, rodents, and nonhuman primates; as well as what types of activities and environments promote opportunities for viral spillover.

At a local scale, the capture of wild animals involves one or more people handling and often butchering the animals, typically with minimal or no protection from injury or exposure to infectious agents. Infection by zoonotic viruses can occur from bites or scratches (e.g. rabies) or through exposure to bodily fluids via the nose, mouth, eyes, or cuts on the skin. The transportation of animals in cages or other containers, often under stressful and unsanitary conditions, can lead to increased transmission of viruses among animals and may provide opportunity for viruses to jump into new hosts - a process that may force a virus to mutate more rapidly and potentially adapt to the new host. Live animal markets may create conditions that further promote animal-to-animal and animal-to-human (e.g. zoonotic) transmission. Animals cages are often stacked on top of each other, and animals are handled and butchered by vendors, providing opportunity for viruses to spread among different animals and to the vendors themselves. These were the circumstances in the wetmarkets where SARS-CoV originally emerged in southern China.

Wildlife Trade in China

The use of wildlife for food and medicinal purposes has existed in Chinese culture, as in other cultures around the world, for thousands of years (12). Wildlife is considered a natural resource to be used by society, and the commercialization of the wildlife trade, via large live animal markets and commercial sale of wildlife-based pharmaceutical products, led to an increase in the consumption of wildlife, largely in southern provinces and in Beijing (12). To meet consumer demand, wild animals, including protected and endangered species, are frequently sourced from other parts of Asia and Africa (12). Wildlife farming has also become an industry in China. The demand for rare and endangered species, which carry particular prestige when eaten or used in traditional medicine, drives unsustainable wildlife trafficking. Although legislation was introduced

in 1988 under the Law on Wild Animal Protection, which specifically lists species that are illegal to trade based on their conservation status, enforcement has been weak, and endangered species continue to be found in markets (12). Live animal markets provide a mixture of legal and illegally traded wildlife, and legal markets may provide cover for illegal wildlife trafficking (6). Awareness of wildlife protection laws among consumers is limited, although there is a growing societal concern among Chinese citizens about animal welfare and conservation, and demand for wildlife as a source of food appears to be gradually waning (12).

SARS coronavirus is an example of a zoonotic virus that emerged through the wildlife trade in southern China. SARS was first detected in people working in urban live animal markets in Guangdong province, in November 2002. Early investigations showed that people who handled and sold animals in the markets and restaurants had a higher likelihood of being infected(13). This was the first indication that SARS coronavirus may have been zoonotic. The virus was subsequently detected in several species of mammals commonly found in markets, including ferret badgers, raccoon dogs, and civets (14). Vendors who sold civets, specifically, had a high rate of infection, and the virus was isolated from civets, suggesting that they may be the source of the virus. However, studies of civets on farms around Guangdong found that they were not infected, which suggested that civets were infected within the markets and were not the wildlife reservoir for the virus (15). Investigation of the natural reservoir for SARS-CoV by EcoHealth Alliance and collaborators led to the discovery in 2004 of coronaviruses closely related to SARS in four species of horseshoe bats, small cave-dwelling bats common across southern China (16). Since 2004, extensive and ongoing surveillance of coronaviruses in bats has led to the discovery of dozens of SARS-related coronaviruses horseshoe bats, some of which have the potential to infect people based on their use of the same receptor that SARS and SARS CoV-2 uses (the ACE-2 receptor) (17, 18). Data collected from bats globally by EcoHealth Alliance and our colleagues, suggests that they are the original reservoir for all mammalian coronaviruses, some of which continue to pose a threat to human health (19, 20). The diversity of SARS-related coronaviruses found in bats since the emergence of SARS-CoV, including Middle East Respiratory Syndrome coronavirus which emerged in Saudi Arabia in 2012, provided abundant evidence that there was a continuous risk that another zoonotic coronavirus could emerge from bats.

The potential role of wildlife trafficking in the emergence of SARS-CoV-2

The recognition of a cluster of 41 human pneumonia cases in Wuhan, China, in late December 2019 led to identification of a new coronavirus responsible for severe respiratory disease (21). The genomic sequence of the virus was about 80% similar to SARS CoV – different enough that it was a distinct virus, but close enough that it would be classified within the same group of beta-coronaviruses (22). It was called SARS-CoV-2 and its associated respiratory syndrome was named Coronavirus Infectious Disease 2019, or COVID-19. Early cases had been vendors or patrons of the Huanan Seafood Market in Wuhan, Hubei province, which led to the assumption that the virus had emerged in the market (21). However, some of the earliest known cases associated with the

pneumonia cluster which were identified in early December, had not had any reported contact with the market, suggesting that they had been infected elsewhere (21). Analyses of the genomes of SARS-CoV-2 from patients and related coronaviruses from bats and other animals suggests that this virus may have begun circulating in humans as early as November, 2019, which is supported by epidemiologic evidence (23). Comparison of the viral genome to genetic sequences from archived bat samples by the Wuhan Institute of Virology found that SARS-CoV-2 was 96% genetically identical to a viral sequence that had been found in a Horseshoe bat collected in 2013 from Yunnan Province (22). This is the closest viral relative that has been found. While the Huanan market may have played a role in spreading the virus, it does not appear to be the origin of the outbreak, leaving open the question of how this virus emerged from a presumptive bat reservoir to humans. Based on the genetic differences between this and SARS-CoV-2, it is unlikely that this exact virus directly jumped into people to cause COVID-19. It is likely that a more closely related virus exists in bats, which may have directly infected humans and then changed over time or possibly moved through other animal hosts before doing so.

There is currently no evidence pointing to any specific animal that may have been involved in the emergence of SARS-CoV-2, but it is capable of infecting a range of mammals, like SARS CoV, based on its use of the ACE-2 receptor. Cats, mink, ferrets, and nonhuman primates are all susceptible to infection by SARS-CoV-2 (24, 25). Civets, ferret badgers and raccoon dogs, as well as cats, are commonly found in wetmarkets in China and are potentially susceptible to infection by SARS-CoV-2 based on their known susceptibility to SARS-CoV. Pangolins are among the most trafficked animals in the world (6). Coronaviruses have been identified in Malayan pangolins which were confiscated in southern China, *en route* to wildlife markets. The pangolin coronavirus was overall more distantly related to SARS-CoV-2 than those in bats, except for a specific part of their genome which closely matched a gene sequence in SARS-CoV-2 (26, 27). The infected pangolins may have originated in Malaysia or elsewhere in Southeast Asia, but were sampled after days of being transported. By contrast, a recent study by our group of more than 300 pangolins confiscated at their point of origin in Malaysia, found no evidence of coronavirus infection (28). While it is unknown whether pangolins were involved in the evolution of SARS-CoV-2, it is possible that exchange of genetic material, a process called "recombination," between bat and pangolin coronaviruses occurred prior to infecting humans (29). Finding coronavirus infection downstream in the wildlife value chain suggests that wildlife trafficking can play a role in zoonotic disease transmission and emergence. In Viet Nam, coronavirus infection was found to be more frequent in mammals such as rodents and bats further along the wildlife value chain (e.g. in markets or on farms) compared to wild populations (30). <u>More surveillance in wild bats, farmed animals and trafficked wildlife in and around china will be necessary to understand the extent to which wildlife markets may have contributed to its emergence.</u>

While wildlife trade is a high-risk interface between wildlife and people and increases opportunity for viral spillover, it is important to note that it is just one of several important routes by which wildlife viruses can emerge. There is evidence that exposure to bat-borne SARS-like coronaviruses

has occurred within communities in Yunnan, China that lived in close proximity to a cave containing horseshoe bats known to be infected with a variety of SARS-related coronaviruses(31). Bats shed coronaviruses in their excreta, especially feces. People and other animals may be exposed to bat feces and coronaviruses in several contexts: through direct exposure to guano by entering caves, through food contamination (e.g. contamination of animal food or water on a farm) or through contact during hunting or transportation to markets. Bat guano is commonly used as fertilizer in many countries. Where wildlife trade does occur, it's important that wildlife surveillance for zoonotic viruses take a One Health approach, concurrently screening animals and people across the entire value chain, from communities to transported wildlife, farms and markets, to better characterize the risk of spillover and emergence.

Risk of disease introduction to the United States through the wildlife trade and trafficking

Wildlife importation to supply the pet industry can also be a source of introduction of zoonotic viruses. In 2003, monkeypox virus was introduced to the United States via the importation of rodents from Ghana, where the virus is endemic and carried by rodents (32). Monkeypox virus, a disease which has a 10% case fatality rate, can be particularly serious in children. The rodents were imported legally by a pet wholesaler, and co-mingled with other rodents including prairie-dogs, which are native to North America. The prairie dogs became infected and subsequently caused an outbreak of monkeypox in 37 people, including a 6-year old girl who developed severe encephalitis (33). This was the first instance of a monkeypox outbreak in the western hemisphere, and is illustrative of the risks associated with importing exotic animals. In response to this outbreak, the US CDC imposed a ban on importation of African rodents without permits. While specific bans of known reservoirs for zoonotic pathogens may help manage the risk of a repeated introduction, they do not prevent rodents, in this case, or other animals being imported from other parts of the world such as Europe, South America, or Asia.

Bushmeat is illegally imported into the United States and Europe large quantities in and sold in black markets. International demand for bushmeat from Africa is driven by expat communities seeking to maintain traditional diets (5). Bushmeat often includes endangered or CITES protected species (e.g. chimpanzees, forest antelopes) which have been associated with zoonotic pathogens, including Ebola virus (34). EcoHealth Alliance, working with CDC and the USGS National Wildlife Health Center in 2012, found that smuggled bushmeat from chimpanzees, other primates, rodents and warthogs originating in West Africa and confiscated at airports including JFK in New York, contained traces of zoonotic viruses including retroviruses and herpesviruses (35). The extent to which illegally trafficked live animals may introduce zoonotic pathogens to the US is difficult to determine given the paucity of data, however, these findings in bushmeat suggests that animal parts may also potentially be a source of zoonotic disease introduction (35). *Improved surveillance for pathogens in wildlife and bushmeat at US borders would improve our ability to asses risk and implement measures to further reduce risk of disease introduction into the United States.*

Part Three: Opportunities for US Fish and Wildlife Service to engage with other US agencies in zoonotic disease surveillance in trafficked wildlife

Pre-border surveillance - screening animals that are part of the wildlife trade in their countries of origin, is critically important for understanding the risks involved in zoonotic disease emergence, as well as the risks associated with animal importation. US government investments in agencies and research programs that work with local governments in parts of the world that are particularly vulnerable to disease emergence through the wildlife trade and other means, can provide valuable insight and information necessary to assess risk, as well as to prepare for the next pandemic. The Convention on the Trade of Endangered Species (CITES) is the main international treaty that regulates the movement of animals. Unfortunately, it is insufficient to prevent disease emergence for three main reasons: 1) it does not include disease concerns; 2) it does not govern species that are not listed under CITES; and 3) it does not govern the intra-national movement of animals. Targeted surveillance in wildlife that are part of the global wildlife trade is required at every stage, beginning with free-ranging populations and extending to wildlife farms, confiscated animals being smuggled, and animals legally being shipped at points of export.

A One Health approach to disease surveillance recognizes the connection among people, livestock and wildlife with respect to infectious disease and is useful for understanding the risk and frequency of disease emergence from wildlife. Implementation of a One Health framework requires that agencies in these three sectors engage in coordinated and cooperative surveillance activities to effectively assess and mitigate the risk of zoonotic disease emergence. There are relatively few national or inter-governmental organizations that focus on disease surveillance in wildlife. The International Union for the Conservation of Nature and the World Organization for Animal Health each have volunteer specialist groups that focus on zoonotic pathogens in wildlife and domestic animals, but other global surveillance activities are poorly funded, short-lived, and tend to focus on a few priority diseases, rather than systemic strengthening to deal with unknown future emergence events or "Disease X."

This presents an opportunity for the United States Government to examine its current human and animal surveillance systems, particularly related to wildlife trade and trafficking, to try to narrow gaps that allow for the emergence of zoonotic agents.

In 2010, a report by the Government Accountability Office to the Department of Homeland Security and Governmental Affairs, US Senate entitled " LIVE ANIMAL IMPORTS: Agencies Need Better Collaboration to Reduce the Risk of Animal-Related Diseases" highlighted the roles of US agencies involved in disease surveillance, and gaps that existed among them when it came to screening imported wildlife for zoonotic pathogens (36).

The main findings of the report were that:

- *There was no single agency responsible for screening live animal imports for zoonotic agents;*
- The US Centers for Disease Control and Prevention established restrictions on wildlife imports only once a zoonotic virus had been identified in a specific species, but it did
- not set policy restricting wildlife species that had not yet been identified with specific pathogens of concern;
- The Department of the Interior's US Fish and Wildlife Service was generally engaged in preventing the importation of endangered or invasive wildlife species, but did not generally conduct testing for significant zoonotic or other important pathogens in imported wildlife;
- The US Department of Agriculture generally works to regulate domestic animal imports and its Animal and Plant Health Inspection Service (APHIS) prohibits the importation of animals or animal products that could contain agricultural pathogens (e.g. viruses, bacteria, parasites that threaten livestock health), but it does not screen wildlife for zoonotic pathogens;
- The report identified a need for better coordination among US agencies responsible for disease surveillance, including data sharing and private sector entities (e.g. NGOs and universities) that could help fill some of the gaps in surveillance;

Other agencies contributing to zoonotic disease surveillance in wildlife internationally include the Department of Defense, through its Cooperative Biological Threat Reduction program at the Defense Threat Reduction Agency which funds collaborative research and capacity building projects with local scientific institutions and governments to reduce the threat of high consequence zoonotic pathogens emerging. The USGS National Wildlife Health Center works with USFWS, the CDC and USDA to conduct wildlife disease research, some of which involved zoonotic pathogens such as avian influenza and plague. The National Institutes of Health (National Institute of Allergy and Infectious Diseases and the Fogarty International Center) and the National Science Foundation funds research related to understanding the epidemiology and ecology of emerging zoonoses, which may involve wildlife surveillance coupled with human studies.

In the years since this report became public, there have been incremental improvements in coordination among agencies. Examples of coordinated surveillance efforts between the US Fish and Wildlife Service and CDC, the USGS National Wildlife Health Center and USDA, as well as with NGOs, including EcoHealth Alliance and universities include surveillance for highly pathogenic avian influenza and the study of confiscated wildlife and bushmeat at US airports. However, there is still a need for a more comprehensive statutory framework that will establish consistent disease surveillance in imported wildlife, and policies based on current science related to groups of

animals known to carry zoonotic pathogens. From a wildlife trafficking standpoint, by increasing USFWS's ability to support wildlife agencies in other countries who confiscate wildlife from the illegal trade and to test those animals for viruses or bacteria that may pose a threat, we can have a better understanding of the actual risk to health at different stages of the wildlife value chain as animals are captured, transported with other animals, and brought into a market systems where there is increased contact with people and domestic animals.

Beyond US border surveillance, conducting disease surveillance in wildlife in EID hotspot countries is vital to earl detection and response to emerging zoonoses. In 2009, the United States Agency for International Development launched the Emerging Pandemic Threats: PREDICT program. This program was led by a consortium of universities and NGOs, including EcoHealth Alliance, working with local governments and agencies in more than 25 EID hotspot countries, to build capacity to more rapidly detect and respond to outbreaks of novel zoonotic viruses(37). The program, which invested approximately $200 million over 10 years, was the largest One Health global surveillance project in history. It screened key wildlife groups (bats, rodents and primates) for novel viruses, while strengthening systems in ministries of environment (e.g. wildlife departments) to more effectively engage in disease surveillance and coordinate with health and livestock departments through coordinated surveillance activities. There is opportunity for USFWS to build on the strengths of the Emerging Pandemic Threats program, by engaging in wildlife surveillance both at the US border, and as part of its international engagements, on the frontlines of the wildlife trade.

Opportunities for the USFWS to help reduce the risk of zoonotic disease emergence

Wildlife trade and trafficking are significant drivers of zoonotic disease emergence, and the USFWS is in a position to be a leading agency in developing and implementing risk reduction strategies for spillover and emergence of zoonotic pathogens into human populations. The following suggested actions are potential opportunities for USFWS to more effectively work towards reducing the risk of zoonotic disease emergence caused by wildlife trade and trafficking:

1) Conduct an internal review of resource needs to implement wildlife disease surveillance at-border and pre-border & to identify and remove barriers to more effective coordination with other US agencies;
2) Expand USFWS's mandate to lead US agencies on border surveillance and pre-border disease surveillance;
3) Improve coordination with other US agencies responsible for disease surveillance in animals (e.g. USDA, USGS NWHC, and CDC);
4) Work with partner countries, particularly wildlife and anti-trafficking agencies, to develop and implement risk-reduction strategies for disease transmission related to wildlife trade and trafficking;

a. Use combinations of legislation, enforcement, and behavioral risk reduction in communities to reduce demand for wildlife, not just supply;
b. Support community engagement to better understand behaviors and help provide alternatives to wildlife use;

5) Encourage regulated and monitored domestic breeding of exotic animals or wildlife – and establish pathogen monitoring & health regulations;
6) Engage in public-private partnerships w NGOs such as EcoHealth Alliance and others to study zoonotic pathogens in trafficked animals and to develop sustainable, market-driven solutions;
7) Study the risk of live animal markets (wild and domestic animals) and support the transition to modern food systems with refrigeration, food safety testing, etc…

There is still a need for a more comprehensive statutory framework that will establish consistent disease surveillance in imported wildlife, and policies based on current science related to groups of animals known to carry zoonotic pathogens. By providing increased resources and an expanded mandate to USFWS to hire epidemiologists, more veterinarians, and establish links with diagnostic laboratories, the US can establish stronger border and pre-border surveillance in wildlife. From a wildlife trafficking standpoint, by increasing USFWS's ability to support wildlife agencies in other countries who confiscate wildlife from the illegal trade and to test those animals for viruses or bacteria that may pose a threat to human and animal health, we can have a better understanding of the actual risk to health at different stages of the wildlife value chain as animals are captured, transported with other animals, and brought into a market systems where there is increased contact with people and domestic animals. By improving disease surveillance within the wildlife trade, USFWS can then develop and implement policies that will be more effective at preventing epidemics. The investment required to reduce the risk of zoonotic disease outbreaks would be miniscule compared to the economic damages associated with pandemics like COVID-19.

Part Four: Conclusion

Chairman Barrosso and Ranking Member Carper, thank you again for convening this hearing on a matter of critical importance both protecting and conserving biodiversity and to global health. I appreciate the opportunity to speak today on the topic of wildlife trafficking and zoonotic disease emergence. As we meet in the midst of one of the worst global pandemics in history, caused by a virus that likely originated in wildlife, it is a stark reminder of the complex challenges we face as a nation when it comes to protecting the health of Americans at home and around the world. There is no longer any separation between populations or countries when it comes to infectious disease. Outbreaks that happen anywhere in the world can affect anyone in the world – we are all connected. We have an opportunity to learn from a large body of scientific evidence that tells us that pandemic prevention requires effort on all fronts: human health, livestock health, and wildlife health. The US Fish and Wildlife Service should join the CDC, USDA, and NWHC as a health agency, and is in a position to help us reduce the risk of diseases emerging through wildlife trade and trafficking. I thank the Committee for strong bipartisan leadership on this matter.

EcoHealth Alliance
520 Eighth Avenue, Ste. 1200
New York, NY 10018
212.380.4460
EcoHealthAlliance.org

EcoHealth Alliance

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EcoHealth Alliance
520 Eighth Avenue, Ste. 1200
New York, NY 10018
212.380.4460
EcoHealthAlliance.org

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EcoHealth Alliance
520 Eighth Avenue, Ste. 1200
New York, NY 10018
212.380.4460
EcoHealthAlliance.org

Senate Committee on Environment and Public Works
Hearing entitled, "Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking."
July 22, 2020
Questions for the Record for Dr. Jonathan H. Epstein

Senators Carper, Sanders and Gillibrand,
Thank you for these thoughtful and important questions, and for the opportunity to respond to them. I have included my responses below each question.

Sincerely,
Dr. Jonathan Epstein

Senator Carper:

1. A large body of scientific evidence suggests that both habitat loss and fragmentation are contributing to the potential for transmission of zoonotic diseases.
    a. As our Committee considers the impacts of wildlife trafficking on the spread of zoonotic disease, do you agree that we should also consider the impacts of habitat loss?

    Emphatically, yes! Habitat loss or changes in landscape are dynamic processes (e.g. converting pristine forest to farmland or to urban/suburban landscapes) that impact biodiversity and human and livestock exposure to wildlife as animal populations are displaced. It's during the process of land use change that we are at increased risk for exposure to new zoonotic viruses because we are coming into contact more frequently with wildlife and with species to which we may not normally have exposure. When we build faming systems with livestock on the edge of forests, we allow for increased contact between domestic animals and wildlife, which has also led to the emergence of zoonotic viruses. With this understanding, we have to consider that deforestation and other types of habitat loss can negatively impact our health.

    b. What steps could our Committee and the Congress take to address this part of the problem?

    Within the US, integrating health considerations into environmental impact assessments prior to developing land – particularly pristine land, would mandate looking at the risk of infectious disease outbreaks that might result from the development. This is not something that's historically been considered, but would be appropriate given what we understand about the importance of land use change as a driver of zoonotic disease. There is some precedent for this – the City of San Antonio, Texas, conducted both an ecohealth impact assessment when considering whether or not to allow a commercial developer to build a residential community within close proximity to Bracken Cave – home of the largest population of Mexican free-tailed bats in the world (est. 15-20 million bats).

They asked what the potential health risks would be to residents with thousands of bats streaming over the neighborhood on a nightly basis. And, they also looked at what the conservation impact would be on the bats and other wildlife of having an 800 unit neighborhood built within a mile or two of the protected cave. The proposed development site was also home to an endangered bird species. The potential health and conservation impacts were ultimately found to be significant, and the land was not developed.

Internationally, the US should continue to work with countries that are undergoing rapid land conversion – particularly those countries which are emerging disease hotspots, to assess and monitor zoonotic diseases in the areas where conversion is happening. This was being done through the USAID PREDICT program, and will continue to be an important component of pandemic preparedness for the US and our partners around the world.

2. In your testimony, you state one of the solutions to preventing zoonotic disease, is to provide alternatives to wildlife use.
    a. Are there any examples where this has worked that Congress can consider in a federal response?

    Yes. The exotic pet industry in America, the UK and other countries have encouraged captive breeding of exotic animals, to reduce the demand for importing wild caught animals to supply the pet trade. This should continue to be promoted to eliminate the importation of wild-caught animals to supply the pet trade, which is often unsustainable and in some cases supports illegal wildlife trafficking.

    One alternative to the consumption of hunted wildlife is supporting wildlife farming as an industry. This has been done in China, where there are certified wildlife farms that raise animals like bamboo rats, porcupines, etc. These aren't entirely without risk, but if it is appropriately regulated, animals on farms and supply chains can and should be monitored for zoonotic pathogens, just as traditional livestock are. This may provide viable income for people so that they can move away from consuming free-ranging wildlife. Again, a regulated and monitored system will be key. Care has to be taken to avoid stocking farms with wild-caught animals, which can potentially introduce disease into a supply chain. Monitoring to ensure that no endangered animals are being sold illicitly would also be important. It's an industry that could be developed and encouraged over time by governments, and may be a better solution for protecting health and biodiversity than an outright ban of wildlife trading, which simply drives the trade underground and makes it more difficult to monitor zoonotic disease emergence.

3. Disease surveillance can be difficult due to inadequate wildlife trade data and insufficient monitoring. This is in part due to the scale and diversity of the global wildlife trade, but also because a lot of the trade operates underground.

a. What data and monitoring gaps are most important to close in order to improve our surveillance capabilities?

Currently, there is very little testing of free-ranging wildlife for viral pathogens in parts of the world that are particularly at risk for disease emergence (e.g. biodiversity hotspots), let alone of animals being trafficked or legally traded. Supporting the systematic surveillance of key wildlife (e.g. bats, rodents, nonhuman primates, migratory waterfowl, etc…) will help build a baseline of information about what viruses are circulating in nature, which is an important first step to pandemic preparedness. Screening confiscated wildlife for viruses will help us understand whether the trade itself increases the likelihood that animals will be infected and infectious as a result of trafficking (e.g. stressful, crowded, contact with other individuals of the same species from different populations and other species).

In the United States, we have a large gap in surveillance of wildlife entering the country – both legal and illegally, which leaves us vulnerable to introducing zoonotic pathogens via the wildlife trade. Creating a workforce within a single agency responsible for wildlife, such as the US Fish and Wildlife Service that can work with other USG agencies at our borders to screen imported wildlife, will help fill this critical gap in surveillance.

4. As we have discussed today, there are zoonotic diseases that emerged right here in the United States. One example is Lyme disease, which scientists first identified in Connecticut and which remains prevalent in my home state of Delaware.
   a. How might vectors, like ticks and mosquitos, exacerbate the already high risk of zoonotic disease transmission caused by wildlife trade?

The importation of exotic animals creates opportunity for the introduction of vector borne pathogens that weren't previously present. If the right mosquito or tick species already occur in parts of the US where they can access exotic animals and their pathogens, then this may increase the risk of introduction into our native wildlife and human populations. We saw this happen with West Nile virus, which emerged in the US via New York City in 1999 and established itself in robins and other native birds across the country. As it spread by mosquitos and established itself in bird reservoirs across the United States, it also killed many native birds (especially crows and jays) in addition to causing outbreaks of fatal encephalitis in people. West Nile virus has since become established throughout the continental US because we had the right wildlife hosts and the right mosquitos to allow it to spread and persist over winters.

One of the impacts of climate change has been and will continue to be an expansion in the range of ticks and mosquitos to parts of the US that used to be too cold to sustain them. This will increase the potential for endemic pathogens like Lyme disease, West Nile virus, or Rocky Mountain spotted fever to spread. It will also create opportunity for mosquito-borne viruses such as Zika, Dengue, and

Chikungunya, which are prevalent in the Caribbean, Central and South America, to be introduced into the US and spread into more temperate parts of the country where they may reach new human populations. There is also the potential for introduced viruses to infect local wildlife species, threatening their health or in some cases establishing themselves within local animal populations that become wildlife reservoirs, as was the case with West Nile virus.

b. Are there steps the United States can take to better manage these risks?

Improved surveillance of imported wildlife for zoonotic viruses and bacteria will help protect our native wildlife as well as domestic animal and human populations. Support for federal and state agencies and other groups that are monitoring wildlife and vector populations throughout the US and research groups looking at how to limit pathogen transmission within mosquitos or ticks and within wildlife will also be important for reducing the risk of new vector-borne diseases from spreading once introduced.

Although CIVD-19 is not a vector-borne disease, the pervasive human infection with SARS-CoV-2 has raised concerns about the potential for native wildlife to be infected by people who work with and handle wildlife. There are North American mammals that may be susceptible to SARS-CoV-2 infection, including ferrets, mink and other mustelids, cats and bats. A task force that includes experts from the US Fish and Wildlife Service, the USGS National Wildlife Health Center, and scientists (including myself) from NGOs and universities have assessed the risk of SARS-CoV-2 transmission from people to bats and other wildlife during activities such as research or rehabilitation. The USFWS recently issued guidelines to protect bats from exposure to SARS-CoV-2 and IUCN and OIE have issued similar guidelines for the international community working with free ranging wildlife.

5. According to some reports, the U.S. imports macaques sourced from the wild for research purposes.
   a. How can the U.S. ensure legal, virus-free sourcing of these wild-caught primates?

Importers should strive to source animals from reputable suppliers who have good biosecurity practices and infrastructure in place within their facility to limit their animals exposure to wild animals or people prior to export, however, <u>there is no testing requirement for zoonotic pathogens at the point of origin which makes it impossible to ensure that wild-caught macaques are not infected with zoonotic pathogens</u>. Imported nonhuman primates are considered potentially infectious throughout transit and are handled with appropriate precautions as they move into quarantine facilities.

For the reason mentioned above, as well as the history of importing macaques infected with Reston Ebola virus, the US CDC regulates the importation of all nonhuman primates, which can only be imported for research, education or exhibition purposed (e.g. not pets). The CDC imposes a 31-day quarantine period, in US facilities, for all imported

primates, and health inspections to ensure that animals are not infected with tuberculosis or Ebola, in the case of Old World (e.g. from Africa or Asia) primates.

A major challenge with current protocols is that animals are only screened for known pathogens (e.g. Ebola or tuberculosis) but may be carrying other viruses that could be zoonotic. Laboratory personnel use personal protective equipment (gloves, respirator, face shield, etc…) to prevent infection from nonhuman primates, but some animals are imported by zoos or educational facilities where there may be greater possibility of exposure by staff or members of the public.

There are nonhuman primate colonies in the US that breed macaques known to be free of certain pathogens. This may be the safest strategy in terms of limiting the risk of importing infectious agents from overseas facilities. I'm not certain to what extent these facilities are currently able to meet the demands of US research labs that use nonhuman primates.

One action that could help reduce the risk of introduction of zoonotic pathogens is to implement broad-based screening of quarantined primates, using genetic sequencing platforms that would detect genetic material from any virus or bacteria present in clinical samples taken from each primate. The laboratory technology is becoming increasingly affordable, portable, and automated, which would make implementation practical.

Another action that could further reduce the risk of importation of infectious agents in nonhuman primates is to require vendors that sell nonhuman primates to US importers to quarantine and screen their animals using broad-based tests before they export them. Further studies would have to evaluate the economic burden this might place on suppliers, but it might be in the interest of the US government to support the development of testing facilities at reputable, high quality suppliers, if they don't already have them.

b. What role can the U.S. Fish and Wildlife Service and other agencies play to ensure the safety and legality of these trades?

USFWS could support CDC's efforts to control the importation of nonhuman primates by working with CDC to quarantine and screen confiscated trafficked primates that otherwise might not make it to official HHS quarantine facilities. Further, should USFWS expand their scope to include pre-border surveillance in wildlife, their activities could include working with nonhuman primate exporting facilities to create quarantine and screening capacity to help reduce the risk of infected animals being exported to the United States.

6. To address zoonotic diseases in wildlife, southeastern states established the Southeastern Cooperative Wildlife Disease Study at the University of Georgia. Northeastern states launched a similar effort at the University of Pennsylvania.
   a. Could a national network of regional wildlife disease cooperatives improve the U.S. response to zoonotic diseases?

Yes – I think that these networks could contribute substantively to wildlife surveillance and reporting of zoonotic agents in US wildlife populations. This would help expand our baseline understanding of what viruses and bacteria were present in US wildlife, to what degree, and where the incidence of infection intersects with at-risk human populations such as hunters, ranchers, or higher density residential areas. This may be particularly important as we see a rise in vector (mosquito and tick) borne diseases.

Senator Sanders:

7. What specific animal handling practices, procedures, and conditions within the illegal wildlife trade – whether during sourcing, transport, or sale – should be included in national and international pandemic risk reduction discussions and policies?

   There is some risk of transmission of viruses from wildlife to people at every stage of trafficking, from capture to transport along market chains, to within markets at the point of sale. This is why it's critical to fund efforts to understand exactly how viruses like SARS-CoV-2 emerged. In the case of COVID-19 (SARS-CoV-2 virus), we still don't know whether people were infected through direct contact with bats or whether other animals were involved. Exposure to bat-borne coronaviruses has happened in communities that live near bat caves in southern China. Entering a cave can expose one to bat excreta that contains coronaviruses and other zoonotic pathogens. Evidence from pangolin coronavirus studies and wildlife market studies in SE Asia conducted under the USAID PREDICT project suggest that animals within the wildlife trade are more frequently infected with viruses than free-ranging animals. The wildlife transport process itself, which is very stressful for animals, can lead to increased rates of infections. Investigations during the original SARS-CoV outbreak showed that SARS-CoV spread among animals and people within wildlife markets. There was also evidence of environmental contamination of SARS-CoV-2 on surfaces in the Huanan Seafood market in Wuhan, which is where several early cases either worked or visited.

   Some strategies for reducing the risk of future pandemics could include: 1) working with foreign governments to monitor local wildlife populations and traded animals to better understand what viruses are present along market value chains from source to market; 2) working with international governments to regulate live animal markets and improve disinfection and sanitation practices that will reduce the risk of viral transmission *within* markets; and create policies that ensure both illegal and high-risk wildlife (animals known to carry zoonotic viruses) are not traded in markets.

   Banning live animal markets outright will probably not be effective at reducing risk. In fact, it is likely to drive wildlife trade further underground and make it harder to detect viral outbreaks. Therefore, another part of US strategy for reducing risk from wildlife trade should be to reduce demand for wildlife. This includes species that are trafficked for parts used in traditional medicine, such as pangolins. Understanding what drives demand and working to reduce demand for wildlife, particularly in societies where

wildlife are consumed as a luxury and not a necessity, will help to reduce the risk of pandemics and help protect biodiversity which is threatened by wildlife trafficking.

8. How likely are we to experience another pandemic in our lifetime if we do not end or significantly curtail the illegal wildlife trade?

   We are highly likely to see more pandemics like COVID-19 if we continue with business as usual with regard to wildlife trade, both legal and illegal.

9. As you know, many scientists believe that human encroachment on natural ecosystems will increase the incidence, risk, and frequency of disease transmission between humans and animals. How can investments in conservation measures help limit the spread of infectious diseases and prevent future pandemics?

   Land use change is responsible for about 1/3 of all emerging disease outbreaks. The process of deforestation - converting pristine forest to farmland or urban landscapes, impacts how we and our livestock come into contact with wildlife. Areas around the world that are high in biodiversity represent some of the highest risk areas for disease emergence when those habitats are disturbed or destroyed. Protecting intact ecosystems and large pristine landscapes will ultimately be beneficial for our health by reducing the risk of a new or known zoonotic virus causing an outbreak that might lead to a pandemic.

Senator Gillibrand:

10. Dr. Epstein, you mentioned in your testimony that a "One Health" approach is important when addressing wildlife surveillance for zoonotic viruses, and that since there are few national or inter-governmental organizations that focus on disease surveillance, there is an opportunity for the U.S. to examine its current human and animal surveillance systems. One federally funded program that comes to mind is the PREDICT program through USAID, which as you know, screened 164,000 animals and humans and detected 949 novel viruses in zoonotic hotspots across 30 countries between 2009 and 2019. One of the goals was to strengthen existing laboratory capacities abroad. According to the World Organization for Animal Health, there are 125 reference laboratories which are certified to screen for one or more target pathogens, and yet the majority of these labs are not located where the emerging infectious disease (EID) risks are the highest, and typically are not used for broad pathogen surveillance.

    a. What more can the U.S. do to help low- and middle-income countries build capacity to identify and prevent zoonotic threats?

    Efforts like the PREDICT project that build local capacity to respond to infectious disease outbreaks and more rapidly identify their causes by building a workforce that can conduct surveillance for zoonotic viruses in wildlife, livestock and people, are critical for reducing the likelihood of another global pandemic. While PREDICT was effective, it ended after 10 years, and efforts to help make systemic changes require

more time and a sustained effort. In several instances, PREDICT laboratory partners were the first to diagnose COVID-19 in their country (e.g. in Thailand and Malaysia) and have made other important early identifications (identifying a new Ebola outbreak in the Congo that happened during the 2014 West Africa outbreak). The US can continue to support surveillance and research efforts that support and build capacity within laboratories and field-based workforces in countries most vulnerable to emerging zoonotic diseases. These efforts should always have a plan for sustainability, but we should also recognize that many of the EID hotspots are in countries with very limited infrastructure for human and animal health, including disease surveillance, and it may take more than a decade to help create the necessary infrastructure or develop the expertise within the country to allow for effective pandemic preparedness.

Additionally, intergovernmental organizations like the WHO play an important role in supporting low and middle-income countries with outbreak detection and response, which is why the US should maintain its support for the WHO and its animal health counterpart, the OIE (World Organization for Animal Health).

b. Clearly centralized bio-surveillance efforts are expensive, especially for many of the countries with zoonotic disease hotspots and where EID risks are the highest. Are there opportunities for additional international collaboration to establish a more cost-effective, decentralized global disease surveillance system?

Absolutely. There are current examples of US agencies that support cooperative, local biosurveillance networks and infectious disease research in EID hotspots. The Defense Threat Reduction Agency's Biological Threat Reduction Program has been committed to helping strengthen laboratory and field-based biosurveillance and research capacity around high consequence pathogens in countries where they are enzootic (circulating in wildlife reservoirs). NIH's National Institute for Allergy and Infectious Diseases (NIAID) has just launched its Centers for Research in Emerging Infectious Diseases, which establishes a network of research collaborations between US and local partners around the world that focuses on zoonotic pathogens with potential to cause outbreaks. These types of programs, in addition to strengthening lab and field surveillance in places where it matter the most, that also contribute to the more rapid development of therapeutics and vaccines when new viral threats, like SARS-COV-2 are discovered.

Programs like these, as well as the CDC's Field Epidemiology and Lab Training Program, which trains epidemiologists and laboratorians around the world; and like USAID's PREDICT, should continue to be developed and significantly scaled up.

While these are some examples of what we can do to better prepare and prevent the next pandemic, the current overall US investment in agencies like NIH NIAID, DTRA, USAID Global Health Bureau, CDC and activities related to pandemic preparedness is still way too small to prepare the US and its partners for the next pandemic, or to ensure that adequate defenses are in place globally to prevent a local outbreak of a novel

zoonotic virus from spreading and becoming another pandemic, like COVID-19. Investing in public health and pandemic preparedness is a matter of national security – something that should have substantial investment both domestically and as part of our foreign policy. There's little doubt in the scientific community that we're going to experience more pandemics like COVID-19 in the future, and we've seen how quickly an outbreak across the planet can spread globally, causing devastation to lives and national economies.

Providing resources to US agencies that help strengthen surveillance and response systems in the US and in countries that are most vulnerable to emerging diseases will be highly cost effective and cost a fraction of the total financial damages that result from pandemics like COVID-19, which has so far caused a recession in the United States and cost the global economy trillions of dollars.

Senator BARRASSO. Well, thank you so much for joining us, and thanks for that very helpful testimony.

I would like to now turn to Mr. Ashe.

Welcome back to the Committee.

STATEMENT OF DANIEL M. ASHE, PRESIDENT AND CEO, ASSOCIATION OF ZOOS AND AQUARIUMS

Mr. ASHE. Thank you, Chairman Barrasso, and Mr. Ranking Member Carper, for this opportunity to testify today.

Addressing trade in live wild animals, legal and illegal, is an essential step in reducing the risk of pandemics. It is achievable, but U.S. leadership is essential.

As many of the members and the witnesses today have said, we know that diseases spill over from other animals to humans. So it is no surprise that the COVID-19 pandemic is thought to have emerged from trade in wild animals, as did SARS 17 years earlier, MERS, Ebola, HIV-AIDS and many others that have been mentioned.

Our current crisis was predictable and preventable, and unless we learn from it and take stronger steps to understand and reduce related risks in trade, the same will be true of the next pandemic and the next. As the world population grows toward 10 billion by mid-century and we continue to fragment functional ecosystems, continue expanding trade and trafficking in wild animals, and literally turning up the heat on this global cauldron, we will see the risk and frequency of zoonotic diseases continue rising.

The root of the problem is unregulated and underregulated trade in wild animals, particularly for human consumption as food or medicine. This is generally independent of whether the animals are threatened or endangered, whether they are removed from the wild or bred in captivity, or whether the trade is legal, illegal, sustainable, or unsustainable.

The key is determining where and how the trade creates significant risks of disease spillover due to the numbers of animals involved, the crowded and unsanitary conditions and trans-shipment, and in markets, the related stresses on and illnesses in animals, and mixing of domestic and wild animals, both living and dead, risks that are likely elevated in illegal trade.

At this moment, our clear priority should be ending commercial trade in live wild animals for human consumption. It is no easy task, because globally the livelihoods and nutritional needs of millions of people are linked to it.

But of course I have a few thoughts on how we can begin. No. 1, lead by example. Amend the Lacey Act to strengthen our Government's ability to identify, designate, and stop injurious species including dangerous pathogens from entering the United States and from moving in interstate commerce if and when they arrive here.

Two, build a global regulatory framework to regulate this trade. I believe this is best done by amending the existing and successful Convention on International Trade and Endangered Species, or CITES, providing one overarching international framework to regulate trade in wildlife. The United States can lead by building a coalition of like minded countries to advance this effort, and this Com-

mittee can direct the U.S. Fish and Wildlife Service to engage and encourage the CITES Secretariat.

Three, continue expanding efforts to control illegal wildlife trade. The whole of government approach that began during the Obama administration has continued during the Trump administration. It should be supercharged to tackle the entire trade chain, increase enforcement capacity here and abroad, treat wildlife crime as serious crime, reduce demand and expand diplomacy.

Four, in large U.S. efforts in international conservation like the Central Africa Regional Program for the Environment or CARPE, run by the United States Fish and Wildlife Service, remove recently imposed sanctions and barriers on that program, and support large scale global initiatives like Campaign for Nature, to protect 30 percent of nature by 2030.

If we do these things, we can pressure and support other governments in permanently closing high risk wildlife markets while helping communities and wildlife live a healthier coexistence, and transition to more reliable, affordable, and sustainable sources of nutrition.

AZA accredited aquariums and zoos are experts in the trade, trans-shipment, care, and conservation of wildlife, and the safe and healthy interaction between wildlife and humans.

We stand ready to support and help you move this important issue forward.

Thank you very much, Mr. Chairman.

[The prepared statement of Mr. Ashe follows:]

Testimony

of

DAN ASHE
PRESIDENT & CEO
ASSOCIATION OF ZOOS AND AQUARIUMS

before the

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

U.S. SENATE

on

"Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking."

July 22, 2020

Thank you Chairman Barrasso and Ranking Member Carper for the opportunity to testify before the Committee about the relationships between wildlife trade and trafficking and the spread of zoonotic diseases, and particularly the role of U.S. Fish and Wildlife Service. It's always a pleasure to appear before your Committee, and I want to say thank you for the kindness and courtesy you have shown me in years past.

As a former U.S. Fish and Wildlife Service Director and career employee, and as current President and CEO of The Association of Zoos and Aquariums, I applaud your leadership in addressing the trade in wild animals, legal and illegal, that exacerbates the risks of zoonotic disease transmission, and pandemics such as our nation and the world are now suffering. There are available and achievable ways for us to reduce those risks. The key ingredient is leadership, and again, your leadership in convening this hearing is a positive step.

I think I bring a unique set of experience to this discussion. I am a former leader of the nation's principal wildlife trade regulatory and enforcement agency, and now, I represent an organization of 240 accredited members that engage in, and depend upon, legal, sustainable, safe and ethical trade in wild animals.

Founded in 1924, AZA is a 501(c)3 non-profit organization dedicated to ensuring that our 240 member zoos, aquariums, nature centers, and science centers represent the very best in animal care and welfare, conservation, education, science, and guest experience. In 2018, AZA's accredited member facilities welcomed nearly 200 million visitors (more than all professional sports combined), generated more than $22 billion in economic activity, and supported more than 208,000 jobs across the country. Also in 2019, they contributed $232 million in direct support for field conservation in 127 countries benefiting 987 species and subspecies, of which 246 are listed under the ESA.

At the heart of AZA is its mandatory accreditation requirement, which assures that only those zoos and aquariums that meet the highest standards can become members. The rigorous, independent, objective, and exhaustive AZA accreditation process includes self-evaluation, on-site inspection, and peer review. Our standards are publicly available and are continuously evolving and improving as we learn more about the needs of the animals in our care. Once earned, AZA accreditation confers best-in-class status, an important message for local, state, and federal government and the visiting public.

AZA and its members are leaders, partners, and participants in species conservation. We work in concert with Congress, the federal agencies, conservation organizations, state governments, the private sector, and the general public to conserve our wildlife heritage. AZA and its member facilities have long-standing partnerships with the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of Agriculture (USDA). Our collaborative efforts have focused on:

- Engaging in endangered species recovery and reintroduction;

- Supporting conservation domestically and internationally through multinational species conservation funds and state wildlife grants; and

- Collaborating on partnership opportunities involving national parks and wildlife refuges, migratory birds, freshwater and saltwater fisheries, national marine sanctuaries, illegal wildlife trade, amphibians, and invasive species.

AZA's Wildlife Trafficking Alliance (WTA) is a joint effort to combat wildlife trafficking around the world. WTA is a coalition of more than 80 private companies, non-profit organizations, and AZA-accredited facilities working together to combat wildlife trafficking by raising public awareness, reducing consumer demand for wildlife and wildlife products, and mobilizing companies to adopt best practices to stop wildlife trafficking.

The Threat is Real, Known, and Preventable

We know that diseases spillover from non-human animals to humans through a process called "zoonosis." In fact, scientific research has concluded that more than 60 percent of emerging infectious diseases in humans are the product of zoonosis, and more than 70 percent of those come from wild animals.

So, it's no surprise that the current COVID-19 pandemic is thought to have emerged from a live animal market in Wuhan, China. And although some have described this as surprising or shocking, it is neither. As the data above show, wild animals are the source of most emerging infectious diseases in humans. Seventeen years earlier, in 2003, another novel coronavirus emerged from the Chinese province of Guandong – causing a disease that we named Severe Acute Respiratory Syndrome or SARS – is believed to have jumped from a horseshoe bat, to heavily traded civet cats and from the civets to humans, killing hundreds.

And this is not just an Asia problem. The infamous "Spanish Flu", the deadliest pandemic in modern history, was not Spanish at all. It was an H1N1 virus of avian origin, and although there is not consensus on where and how it made the jump to humans, many experts believe that happened here, in the U.S., as the first reported cases were in Kansas. Middle East Respiratory Syndrome or MERS is also caused by a novel coronavirus, and likely jumped from bats to camels to humans. The Human Immunodeficiency Virus that causes AIDS, originated in Africa, jumping from chimpanzees to humans through the trade in bushmeat.

So, our current crisis was knowable, predictable and preventable. And unless we learn these lessons and take steps to reduce related risks, the same will be true of the next pandemic, and the next.

And as the world population grows from 7.5 billion toward 10 billion by mid-century, and as we continue disrupting and fragmenting functional ecosystems, and continue expanding trade and trafficking in wild animals, and quite literally keep turning up the heat on this global cauldron, we will see the risk and frequency of zoonosis continue rising.

The Root of the Problem

The root of this problem is unregulated and under-regulated trade in live wild animals, for

human consumption, principally as food, and to a lesser extent as medicine.

Sure, there is risk of disease transmission in every interaction between a human and another animal. We can contract salmonella from a pet gecko; my son asked for one on his 12th birthday, and it lived well past his departure from home to attend college; no one in our family contracted salmonella. We can contract diseases from our companion cats (toxoplasmosis) and dogs (rabies), but our relationships and interactions with geckos, cats, dogs and other animals are largely beneficial, and the disease risks are minimal and manageable.

There are many maladies associated with the global pet trade, and AZA's 240 accredited members suffer, continuously, from the too often abominable record of roadside zoos and transient animal attractions, like we all saw portrayed in the docudrama *Tiger King*. But, these are not significant pandemic risks, and cries to end all trade in live wild animals in the cause of preventing the next pandemic is the kind of solution history has taught us to avoid – neat, plausible and wrong.

Worldwide, the livelihoods and nutritional needs of millions of people are linked to trade in live wild animals. The key to reducing pandemic risk is determining where and how this trade creates significant risks of disease spillover to humans. This threat from commercial trade for human consumption is generally independent of whether or not animals are threatened or endangered, whether or not animals are removed from the wild or bred in captivity, whether their trade is legal or illegal, and whether it is sustainable or unsustainable.

What creates and elevates the risk are the conditions of the trade and sale. From source to market, the supply chain for live wild animals destined for human consumption involves conditions that present a high risk for emergence and transmission of the zoonotic pathogens that are the potential points of origin for future pandemics. The numbers of animals involved; the crowded and unsanitary conditions in transshipment and in markets; the related stresses on, and illnesses in animals; and the mixing of domestic and wild animals, both living and dead, create a super-interface with high-risk for shedding and sharing viruses. These risks are likely elevated in the context of illegal trade.

So, at this moment, our clear priority should be ending commercial trade in live wild animals for human consumption, and AZA is joining with the Wildlife Conservation Society and other partners in campaigns to get this done.

Summary and Recommendation

In a moment when our nation and world is in rapt attention, closeted in our homes, and businesses focused on survival, we need calm, thoughtful and focused action. In this moment, the United States can do what it has historically done best in moments of necessity—lead.

And that leadership should begin by –

1. Amending the Lacey Act to strengthen the government's ability to identify, designate and stop injurious species, including dangerous pathogens from entering the United States, and from moving in interstate commerce if and when they arrive here. The Lacey Act is one of our nation's earliest and most enduring wildlife conservation laws. It should be amended to specifically convey emergency listing authority; explicitly authorizing listing

of human pathogens as injurious species; and authorizing the regulation of interstate commerce in listed injurious species. Amending the Lacey Act in this way will also show the world that the U.S. is not just wagging its finger at the rest of the world. We are taking action to identify and address high-risk domestic trade.

2. To effectively address the global threat of zoonotic disease, we need a global regulatory framework to mitigate this risk. We believe this framework already exists in the Convention on International Trade in Endangered Species (CITES), which regulates more than 30,000 species of plants and animals through a legally binding permitting system. Rather than pursue another framework to address threats to human or animal health, we believe the right path is to amend CITES to cover these threats, so that we have one over-arching international framework to regulate trade in wildlife. We are working with a new initiative, End Wildlife Crime, on this effort. The United States, can lead the way by building a coalition of like-minded countries to advance this effort. We stand ready to help. The U.S. Fish and Wildlife Service is the nation's diplomatic and scientific lead for CITES, and this Committee should encourage and empower the Service to engage the CITES Secretariat to take a leadership role.

3. Continue leading and expanding efforts to control illegal wildlife trade. Because illegal trade, by its nature, must be concealed, it represents heightened risks and uncertainties. For decades, we had been bringing a knife to a gun fight. Under-resourced, too narrowly focused, and without the full set of tools, we were always fighting an unwinnable battle. That began to change in 2013 with President Obama's Executive Order on Wildlife Trafficking, the application of a whole-of-government approach, a holistic national strategy, and commitments from Congress to greatly increase resources. The results came quickly both domestically and internationally, and this holistic approach has continued in this administration. Rather than a focus solely on protected areas and enforcement in consumer countries, we were tackling the entire trade chain, increasing enforcement capacity at home and abroad, treating wildlife crime as serious crime, employing professional demand reduction efforts, and having major diplomatic wins such as China's ivory trade ban in reaction to ivory trade regulation here in the United States.

4. The United States has been a global leader in international conservation for decades, supporting governments by building their capacities in protecting their wildlife and wild places, strengthening wildlife law enforcement, professionalizing wildlife agencies, and empowering local communities to be good stewards of the land and resources on which they depend. We need to continue and expand those efforts, like the Central Africa Regional Program for the Environment (CARPE), remove recently-imposed sanctions and barriers to this assistance, and encourage and support large-scale global initiatives like Campaign for Nature, and the effort to protect 30 percent of nature by 2030.

5. Pressuring and supporting governments around the world to permanently close under-regulated and unregulated wildlife markets, while helping communities and wildlife live a healthier coexistence. We need to remember that wildlife, and wild animal markets are a necessary source of economic and nutritional support for communities globally. We need to help those nations and communities make a transition to more reliable, affordable and sustainable sources of nutrition.

As the committee considers policy solutions to the threat posed by zoonotic diseases and the illegal wildlife trade, AZA and the AZA-accredited facilities in your states stand ready to assist and support you. Our members are experts in the trade, transshipment, care and conservation of wildlife and the safe and healthy interaction of humans and wildlife. We readily share that expertise and stand ready to support and help you as you move this important issue forward.

Thank you for the opportunity to testify on this important matter, and I would be happy to answer any questions that you may have.

Senate Committee on Environment and Public Works
Hearing entitled, *"Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking."*
July 22, 2020
Questions for the Record for the Honorable Daniel Ashe

Senator Carper:

1. A large body of scientific evidence suggests that both habitat loss and fragmentation are contributing to the potential for transmission of zoonotic diseases.
    a. As our Committee considers the impacts of wildlife trafficking on the spread of zoonotic disease, do you agree that we should also consider the impacts of habitat loss?

    Absolutely! There are multiple sources of risk in the generation and transmission of zoonotic diseases. Certainly, unethical, unregulated, under-regulated, and illegal trade in wild animals, principally for human consumption, is a major risk. But it is heightened by other factors, including habitat loss, the related ecosystem disruptions, and the increased contact between humans and wild animals.

    b. What steps could our Committee and the Congress take to address this part of the problem?

    I always begin with leadership. Rather than wagging fingers at other countries, the U.S. should begin by leading, right here at home. Stop high-risk wildlife trade and markets in the United States. Yes, we have it here too. Amend the Lacey Act to facilitate injurious species listings, including species that pose a threat to human or animal health, and control of import, export, and interstate trade in listed species. Join the world community in supporting large conservation efforts, like 30-by-30 and E.O. Wilson's Half-Earth Initiative. And end efforts to develop already protected areas, like the Tongass National Forest, the Arctic National Wildlife Refuge, and the Northeast Canyons and Seamounts Marine National Monument.
    Address serious gaps in international law by – 1) leading efforts to amend the Convention on International Trade in Endangered Species (CITES) to transform it into a "One-health" framework, incorporating both animal and public health; and 2) encourage adoption of a 4th Protocol on wildlife crime under the U.N. Convention against Transnational Organised Crime.

2. Your testimony states that unregulated and under-regulated trade in wild animals is a driver of the spread of zoonotic disease. Sometimes when one country bans or heavily regulates certain trades, trading simply begins to occur in other countries or traffickers move underground and become more difficult to monitor.
    a. As the U.S. and other countries attempt to address unregulated and under-regulated wildlife trade, how can we prevent this shift to more illegal activity?

A necessary element of pandemic prevention will be rigorous monitoring, surveillance, and enforcement. The U.S. Fish and Wildlife Service, in particular, will need to play a vital and expanded role, so the agency will need additional funding for both inspection and enforcement.
We also need to address demand, which will require funding to affect behavior change, including developing alternative and sustainable sources of protein in countries where significant populations remain dependent on wild animals.

3. Given the nature of wildlife trade and zoonotic disease, the U.S. Fish and Wildlife Service (USFWS) must cooperate with a number of federal agencies and non-governmental organizations to monitor wildlife trade and prevent trafficking. They also work with established international organizations, such as the International Criminal Police Organization.
    a. How could the Service improve interagency collaboration to prevent the spread of future zoonotic diseases?

       The Interagency Taskforce on Wildlife Trafficking, established during the Obama Administration, and continuously supported during the Trump Administration is the appropriate coordinating body. It should be supported by strong leadership and a clear commitment from Congress.
    b. What about coordination with non-governmental organizations and other international organizations?

       The Interagency Taskforce can also serve this function, but the U.S. government, particularly the Fish and Wildlife Service and Department of State, should directly engage the NGO community in supporting amendments to CITES and the 4th Protocol on Wildlife Crime that I mention above.
    c. Are there specific programs that Congress should fund to help this effort?

       I am, of course, biased. The U.S. Fish and Wildlife Service needs additional funding to support wildlife inspections at border ports and airports; additional funding for law enforcement, particularly for placement of law enforcement special agents within key U.S. Embassies (e.g., so-called "Attachés"); additional funding for International Affairs to address demand and to build capacity within and among foreign nations.

4. Attachés stationed in countries overseas by the USFWS Office of Law Enforcement are enhancing anti-wildlife trafficking efforts abroad.
    a. What is your experience with this program, and do you believe the U.S. should deploy more attachés?

       This program was begun when I was serving as USFWS Director. I do not take credit for anything other than giving the idea the enthusiastic support that it deserved. It is an important innovation, and a proven success. Law enforcement, especially internationally, depends upon trust-based relationships. Officers and agents need to be able to share information and sources that are often highly

sensitive, indeed dangerously so. Placing USFWS special agents within U.S. embassies has helped to build and maintain relationships that are paying dividends.

b. Do you believe the USFWS should expand the role of these attachés to help prevent zoonotic disease transmission in high-risk wildlife species, including market inspections in countries where we know high-risk markets are prevalent?

   These special agents are among the world's most highly trained wildlife law enforcement professionals. They do complex investigative work. They should not be used as inspectors, but rather, should follow the leads that result from the work of trained inspectors. It's also important to note that this is not a challenge that will be solved by enforcement alone. It requires policy-makers, health experts, social scientists, and other expertise to address the root causes of both wildlife trafficking and trade and consumption that pose a risk to human and animal health.

5. International wildlife disease monitoring efforts often provide co-benefits. For example, the USFWS International Affairs programs support efforts in Central Africa to monitor wildlife diseases among great apes, like gorillas, that suffer from and transmit Ebola and other zoonotic diseases. These monitoring efforts also support gorilla habituation programs, which allow communities to benefit from gorilla-based tourism programs that are revenue generators for communities, countries and conservation.
   a. How can Congress and the USFWS advance these types of win-win programs?

      Disturbingly, the Interior Department has shackled the Service's highly successful international conservation financial assistance programs. Everyone agrees that steps need to be taken to ensure that funding is sensitive to human dignity and rights, but the Department has effectively frozen millions in financial aid that could be supporting these efforts. The Congress should require these funds be released.

6. USFWS and other U.S. port inspectors currently have no authority to take samples from most species of diseased or dead animals that they discover in live animal shipments.
   a. Does this gap in inspection authority pose risk to public health and native wildlife?

      The Service does have legal authority to seize wildlife that is potentially in violation of Federal wildlife law. The Lacey Act prohibits the import of live wild animals and birds to occur under inhumane and unhealthful conditions, and the Service may seize such wildlife for investigative purposes. To the extent that the Service's authority is limited, for example by the taxa covered by the Lacey Act, Congress should expand this authority.

7. Tribes play an important role in wildlife disease surveillance and response.

a. Are there programs Congress should be funding or processes that Congress can improve to increase tribes' ability to monitor and manage wildlife within their jurisdiction?
Disease surveillance and response is not limited to international trade nor to a particular agency. Tribes and state agencies should be included as key actors in the larger effort to address the threat of zoonotic disease outbreak.

8. To address zoonotic diseases in wildlife, southeastern states established the Southeastern Cooperative Wildlife Disease Study at the University of Georgia. Northeastern states launched a similar effort at the University of Pennsylvania.
   a. Could a national network of regional wildlife disease cooperatives improve the U.S. response to zoonotic diseases?

      Regional efforts are useful, but zoonotic disease does not adhere to state or national borders. Thus, a larger coordination effort, across agencies and governments, is important, including national efforts that connection regional networks.

Senator Sanders:

9. To what degree do wildlife traffickers use the legal wildlife trade (including associated markets, trade routes, or people), to smuggle illegally-sourced wild animals, and how does this use of legal wildlife trade avenues increase the risk of zoonotic disease transmission to humans?

   It is important to keep in mind that trade in live wild animals, and their derivative parts and products, is extensive, here in the U.S. and globally. The vast majority of this trade is ethical, legal and sustainable. It is also undeniable that legal trade can be used by traffickers as a cover for illegal trade. Classic examples of where this occurs are elephant ivory and shark fins, which is why it is imperative to maintain strict bans on trade in those commodities. And while effective surveillance, enforcement and prosecution of illegal trade is crucial, wildlife trafficking is not the exclusive or even primary risk factor in zoonotic disease transmission. Effective policy response will require evaluating and addressing risks in both legal and illegal trade.

10. How has the COVID-19 pandemic impacted efforts to conserve habitat and combat the illegal wildlife trade?

    My impression would be that the pandemic has helped in some respects and hurt in others. Help would be in the area of increased awareness on the part of the public and of policy-makers to the issues surrounding trade and trafficking, habitat destruction and ecological disruptions, and risks of zoonotic disease transmission. Harms would be in the loss of time and talent, as the world has been distracted and debilitated by the pandemic. Additionally, we do know that ecotourism economies have been disrupted, and there is evidence that this has set back conservation efforts in countries where this is a significant

source of local income, and a significant incentive for tolerance in human-wildlife conflict.

11. As you know, many scientists believe that human encroachment on natural ecosystems will increase the incidence, risk, and frequency of disease transmission between humans and animals. How can investments in conservation measures help limit the spread of infectious diseases and prevent future pandemics?

As we confront the growing extinction crisis, and seek to conserve diversity of life on planet Earth, our attention focuses on the remaining strongholds of biological diversity and abundance: the Amazon basin; the Congo; Central American rainforests; temperate rainforests, like the Tongass National Forest (yes, we are part of the problem too). These areas harbor a great diversity of life, including abundant and diverse microbial and pathogenic life. When we encroach into these areas, we open ourselves and our larger society to pathogens against which we have no innate defense. We should be conserving these areas, not disturbing them. And our nation should be playing a leading role, by example here at home, and by providing technical and financial assistance internationally.

12. During this hearing, you said that climate change is going to create disruptions and stresses in our planet's ecological systems that will increase the incidence, risk, and frequency of disease transmission between humans and animals, similar to the impact of human encroachment on these natural environments.

a. What are the specific disruptions and stresses that climate change will put on our planet's ecological systems? What are the mechanisms by which these disruptions and stresses will increase the incidence, risk, and frequency of disease transmissions between humans and animals?

   Climate change is an ecological super-disrupter: rising, warming and acidifying oceans; changes in soil moisture; disruption of the delicate biological sequencing, known as phenology, that is key to successful life cycles for all species, but especially migratory species; changes in fire regimes; frequency and severity of intense storms; and on and on. When ecological systems are undergoing such disruptive change, animal populations and individuals are under stress; animals under stress are more vulnerable to disease; and with humans coming into contact with animals, especially in the context of live animal markets, it is a recipe for contagion. Until we address climate change, and address our relationship with, and trade in wild animals (especially for consumption as food), these risks will continue to grow.

b. What are the biggest policy shifts the federal government needs to make in regard to addressing climate change to reduce the risk of future pandemics caused by zoonotic disease transmission to humans?

   Make immediate, significant and measurable commitments to reduce and ultimately eliminate the use of fossil fuels for energy.

c. In your view, how can U.S. federal agencies that work to address climate change, such as the Environmental Protection Agency, better coordinate with agencies that are working to prevent zoonotic disease transmission, such as the Fish and Wildlife Service and the Centers for Disease Control, to holistically mitigate the impacts of climate change on zoonotic disease transmission incidence, risk, and frequency?

I think the EPA and the Department of State should focus their efforts on re-entering the Paris Agreement, and pursuing significant, measurable and enforceable commitments toward reduction, and eventual elimination of fossil fuels to produce energy. As part of this international agreement, and funded through global commitments from developed nations, we should protect 30 percent of the planet by 2030, and 50 percent by 2050. These commitments will support ecosystem functions and services that benefit human society (like sequestering carbon), they will conserve biodiversity and help mitigate the current extinction crisis, and they will substantially reduce the threat of disease transmission, zoonosis, and pandemic.

Senator BARRASSO. Well, thank you all for your testimony. I am very grateful you would take your time to visit on this important issue and share your remarkable expertise that each of you have.

Let me start with some questions.

Ms. Semcer, the Chinese communist government has a history of deceiving the world, doing it when it comes to issues that are unfavorable to their country's ruling regime. China claims it is taking action to reduce demand for illegally trafficked wildlife, including banning the domestic trade of ivory, preventing the sale and consumption of wildlife.

Do you believe the Chinese government's efforts are having the desired impact when it comes to reducing the domestic demand for wildlife?

Ms. SEMCER. Mr. Chairman, I would refer the Committee to the recent U.N. World Wildlife Crime Report issued earlier this month, which showed that China remains a leading destination for pangolin, for rhino horn. I would also refer the Committee to a recent report from the World Wildlife Fund showing that all demand for ivory within China has stabilized.

For those Chinese citizens who are able to travel abroad, consumption of ivory has increased by 10 percent between 2018 and 2019. As I said just a few minutes ago, despite the efforts of the Chinese government, they don't seem to be moving fast enough to achieve the desired effect.

Senator BARRASSO. Dr. Epstein, are there some additional activities that you think the U.S. Fish and Wildlife Service should carry out to prevent the spread of zoonotic diseases?

Mr. EPSTEIN. Yes, that is a great question, and I think there are certainly specific activities.

Following on the recommendations from that GAO report that I referenced, one thing to begin with would be an internal review of resource needs that would be required to implement wildlife disease surveillance. One of the things that we are seeing globally that is starting to change, but it is historically not been true, is that wildlife agencies historically have not been part of health response.

Clearly, there is a need for that. And there are also significant gaps in wildlife disease surveillance as it pertains to zoonotic disease. So the Fish and Wildlife Service by conducting internal review to see how there could be improved surveillance, disease surveillance, both at border and pre-border through activities that they are conducting.

Also, to help identify and remove barriers to more effective coordination with other U.S. agencies. That is still something that we need to strive for, is coordination with our human health and livestock health agencies.

Another thing might be to expand U.S. Fish and Wildlife Service's mandate to lead on border surveillance and pre-border disease surveillance to really work to make them the agency that takes charge for screening incoming live animals, particularly wildlife, for zoonotic disease, something that Mr. Ashe mentioned earlier.

Also, to work with partner countries, and particularly wildlife and anti-trafficking agencies, to develop and implement risk reduction strategies for disease transmission related to wildlife trade

and trafficking. There is already really excellent coordination with many wildlife agencies around the world, and this could simply be leverage to add on surveillance and screening activities.

Two other thoughts were that, it is important—and this was something that Dan brought up earlier, Mr. Ashe brought up earlier, which is that legislation alone isn't sufficient. We need to also work to reduce the demand for wildlife locally in other countries.

U.S. Fish and Wildlife Service could play a role in working to really study and understand the sociological drivers that drive consumption of wildlife and work to reduce demand, while at the same time, stepping up enforcement and surveillance activities.

I don't want to take too much time; there are other ideas. But in short, I think really, seeing U.S. Fish and Wildlife Service expand their mandate and start to look at disease surveillance as part of their wildlife activities would be very effective at helping protect both the health of Americans, but also global health as well.

Thank you.

Senator BARRASSO. Thank you.

Ms. Semcer, the climate created by the coronavirus has led to some calls to ban trophy hunting. In September 2019, however, you wrote an article entitled "Conservationists Should Support Trophy Hunting." In that article, you mentioned how 132 researchers joined you in an open letter that was published in Science Magazine, recognizing that trophy hunting operations in the Sub-Saharan Africa area have provided incentives to conserve an area of wildlife habitat more than two times the size of the United States National Park System.

Could you explain to us how trophy hunting conserves land, and in turn, reduces the risk of zoonotic disease spillover?

Ms. SEMCER. Yes, Mr. Chairman. The safari hunting trade in Africa provides economic incentives for the conservation of habitat, particularly in rural areas.

It does this through a number of means: Cost sharing agreements between safari hunting operators and local communities, for example in Zimbabwe, in what are known as the Campfire Areas, local communities get about 50 percent of the proceeds that come from safari hunting operations.

Because of this injection of cash, they then have an incentive to conserve the habitat that the safari hunting operators require to conduct business. That cash has added health effects in that it often goes to create infrastructure, such as development of clean water sources, which is key for doing something that we take for granted, like washing our hands. Similarly, it can be used to build health clinics, which can serve as the early warning system when disease outbreaks do occur.

Senator BARRASSO. Thank you, all of you, for your answers.

I am now just going to turn to Senator Cardin, who is with us remotely.

It appears that he has stepped away for a moment.

Senator Gillibrand, if you are on, I would like to turn the time over to you, please.

Senator GILLIBRAND. Yes, I am here. Thank you.

Mr. Ashe, you mentioned that if we are to effectively address the global threat of zoonotic diseases, we need a global regulatory framework to mitigate the risk. I wholeheartedly agree with that approach, and believe that we must take a similar approach at home.

That is why I am a cosponsor of the Advancing Emergency Preparedness Through One Health Act, which would improve public health preparedness by ensuring Federal agencies advance a one health approach to prevent and respond to future outbreaks. Bridging the gap between research and response is critical to mitigating future human and animal spillover events.

In your experience as a former Director of the U.S. Fish and Wildlife Service, what type of agency coordination seems to be working well, and two, what gaps exist in our current approach, and what can Congress do to fill those gaps?

Mr. ASHE. Thank you, Senator Gillibrand.

The kinds of things that work well are the efforts that are the most collaborative, and you mentioned that. I think we have joined with States and universities and health organizations to tackle issues like chronic wasting disease or Lyme disease. I think we have done extraordinarily well.

I think the gaps often, most often, in my view, are the resources to support that kind of work. So I think as we look forward, both internationally and here in the United States, I think the resources to build the framework to support that kind of collaboration and the science that is needed to drive the decisions that need to be made in the context of those collaborative efforts.

So there are plenty of examples of success here in the United States, but we need to support that success, we need to build upon it. We need to expand it and export that globally so that we can bring the same expertise, the same capacity, the same vision to efforts internationally.

Senator GILLIBRAND. Thank you.

For the entire panel, how does the U.S.'s withdrawal from the World Health Organization affect U.S. participation and engagement in improving international disease surveillance efforts and combating the illegal wildlife trade and wet markets?

Mr. ASHE. I will begin by saying, again, in continuation of my recent answer, I think international cooperation is going to be essential in dealing with these. We can't push off international organizations; we need to bring them together.

I testified in support of the Convention on International Trade and Endangered Species as kind of one coordinated effort to regulate trade and wildlife, but the World Health Organization will bring expertise to that regulatory mechanism.

So I think what this coronavirus pandemic is showing us is that we need to cooperate like we have never cooperated before, because we can't solve these problems from within the United States borders. We have to work internationally if we are going to be successful.

Mr. EPSTEIN. If I may, I would like to build on that, too. I agree wholeheartedly that cooperation with intergovernmental agencies is necessary, because they have trust and relationships and authority as experts with so much of the world. The WHO in particular

has been a proponent of one health approaches to disease surveillance and response and work closely with counterparts and other intergovernmental agencies, such as the World Organization for Animal Health and the IUCN, as well as universities and U.S. Federal agencies.

So that relationship is really important in terms of really being able to not only conduct research activities to understand disease risk, but also to help implement policy change that is going to reduce the risk of diseases emerging.

Senator GILLIBRAND. Dr. Epstein, can I ask you another question? As you know, emerging infectious disease risks associated with wildlife trade continue to be the largest unmet challenge of current disease surveillance efforts.

In your testimony, you indicate that more surveillance of wildlife internationally is needed if we are to fully understand the extent of the role wildlife markets have played in the COVID-19 pandemic. Are there steps that you recommend that the U.S. take to approve global surveillance efforts? How do you recommend prioritizing investments in surveillance efforts? For example, is viral discovery through wildlife surveillance more of a priority than establishing disease surveillance across communities likely to be in or near spillover hot spots?

Mr. EPSTEIN. That is a fantastic question, thank you.

The answer is, yes, absolutely. Understanding what is out there in nature, the diversity of viruses, and understanding which among those should be paid closest attention to in terms of their potential to emerge in human populations will help guide strategies for mitigating risk.

But that has to be done in concert with sociologic and behavioral research that understands where the high risk behaviors are occurring, and in parts of the world such as I showed with the hot spots map where we already know there is increased risk for disease emergence.

So we can prioritize and target interventions and strategies by understanding where the risk is, understanding where we need to be paying attention in terms of the types of wild animal species that are likely to carry zoonotic viruses, and the areas where people and wildlife and domestic animals have the most contact where those viruses are most likely to spill over.

That is how we can effectively get at reducing that risk. That requires cooperation and collaboration with local governments, local scientists, and agencies within country that have the best understanding and knowledge of the local context and circumstances.

Thank you.

Senator GILLIBRAND. Thank you, Mr. Chairman.

Thank you, Mr. Ranking Member.

Senator BARRASSO. Thank you very much, Senator Gillibrand.

Senator Braun.

Senator BRAUN. Thank you, Mr. Chairman.

The importance of this topic is not only for the health considerations, but over a period of time, rural economies, especially any landowners that have wooded property, a significant amount of income comes from leasing hunting rights.

I think that the magnitude of what we are talking about here, especially when I look at the statistics at how prevalent it is for something to jump from one species to ours and highlighted by what we have seen just recently and what we are dealing with, it is almost staggering to think about the implications.

I know in our State of Indiana that we are surrounded, for instance, by chronic wasting disease, which I think, up to this point, has not been proven to jump from a deer into a human being.

But I guess what bothers me mostly would be the infrastructure, at the grassroots level, when it comes to the various State departments of natural resources, which is what ours goes by, then various divisions within.

What is that leading edge of where we are actually going to find out about this before you find out about it the hard way, like we have with COVID? What is that structure like in this country, and how prepared are we to recognize it and do something about it? That would be for any of the panelists.

Mr. ASHE. Senator, I think the most important ingredient is awareness, and then the dedication to attack and solve the problem and the resources to do that. Again, with chronic wasting disease, there has been an enormous effort between the State fish and wildlife agencies and the U.S. Fish and Wildlife Service and the U.S. Department of Agriculture to learn about chronic wasting disease, how it moves, how it spreads among white tailed deer populations, and what to do about it.

So I think the first thing is awareness, that these are risks, there are substantial risks involved in the movement and the use of animals, particularly wild animals, particularly for human food.

We need to learn more about them; we need to build the institutional frameworks to fund the scientific endeavors to evaluate risks, to identify and evaluate risk.

Then we need to build the regulatory mechanisms to control that risk. I think that is the major lesson to me.

Senator BRAUN. Anyone else want to weigh in?

If not, I have a question. What is the most recent example of something that has actually leaped from an animal to a human being that we have caught here in this country, and what was the result of it, and how well did we respond to it?

Mr. EPSTEIN. Perhaps I could start with that. One recent example would be West Nile virus, which was introduced into the United States in 1999. It is an infection that is carried by birds and spread by mosquitos, and it not only can impact people, but also other animals, causing severe encephalitis.

When that was first started, was first discovered in New York, in fact, at the Bronx Zoo, some of the animals in the collection were dying from it. But it quickly spread across the country to all of the States, and research jumped on that.

Our response, collectively, was to understand what the reservoir was. This was recognized as a virus that typically existed in Africa, and this was the first incidence of it here in the United States.

It turned out that at least in the eastern part of the country, robins were a reservoir for this virus, and mosquitos that were transitional and birds. But also mammals, including people, were a bridge vector that was driving transmission. In understanding that,

we were better able to work toward vector control, mosquito control, diagnosing West Nile virus in patients that were presenting to hospitals with encephalitis, and tracking the spread of the virus across the country.

Unfortunately, it was very difficult to stop the spread, and it made it across the country. Nonetheless, that was an example of awareness of the introduction of a zoonotic disease, which is now endemic here.

Senator BRAUN. Thank you.

Senator BARRASSO. Thanks, Senator Braun.

Senator Whitehouse.

Senator WHITEHOUSE. Thank you, Chairman. Thank you for this timely hearing, or perhaps maybe untimely hearing.

A couple questions. First, Ms. Semcer, which international forums or organizations do you think are most effective and should be getting supported by the United States as a matter of our leadership on this issue?

Ms. SEMCER. I believe our continued engagement in the Convention on International Trade and Endangered Species is absolutely critical to addressing this issue.

I would also offer that we should begin more bilateral engagement with our partners in Africa and elsewhere, where there is a high risk of zoonotic disease emergence so that we can tackle this problem not just multilaterally, but bilaterally.

Senator WHITEHOUSE. The role of the World Health Organization?

Ms. SEMCER. As I said in my earlier testimony, I think that what we have seen happen is indicative of the need for greater U.S. leadership on this issue. We cannot count on other countries to succeed in deterring the spread of zoonotic disease through demand reduction campaigns and even outright bans on consumption.

Leadership requires engagement. Whether or not the World Health Organization is the appropriate forum for such leadership and engagement is beyond my area of expertise, but the U.S. must engage with the rest of the world on this issue if we are to confront it.

Senator WHITEHOUSE. Dr. Epstein, what is the next virus that you are worried about? Is there one that you have got your eye on that has not yet popped up into general circulation that is something that concerns you?

Mr. EPSTEIN. That is the million dollar question, isn't it? I will say that collectively, as a group, coronaviruses remain a concern in that we know that there exists a diversity of viruses related to SARS and to SARS-CoVi-2, and continue to circulate in bat populations around parts of southeast and eastern Asia. There is still of a risk of those emerging again, and so that is one we need to keep an eye on.

I think influenza viruses also remain a concern. Those circulate annually and evolve continuously, and still have the potential to cause a pandemic, so flu viruses are important.

A category of virus that I specifically look at that we are paying attention to is called Nipah virus. That is a virus carried by large fruit bats across Asia, and this is a virus that spills over almost annually in Bangladesh and India causing localized outbreaks of

encephalitis. It carries a very high case fatality rate of about 75 percent on average, and so far, it is only capable of limited human to human transmission.

But there is the potential that strains of this virus exist in nature that are more easily transmissible among people. So we are working very hard with local authorities and scientists to put in interventions that will limit the opportunity for that to jump.

So that one is on the radar, but I would say a little differently than things like coronaviruses and influenza viruses, which have proven to be both transmissible and have the ability to cause global pandemics.

Senator WHITEHOUSE. To both of you, which aspects of U.S. trade policy should be brought to bear on dealing with this issue?

Mr. EPSTEIN. Should I begin?

Senator WHITEHOUSE. Sure.

Mr. EPSTEIN. Trade policy, so one of the issues that sparked that report I mentioned earlier from the GAO was really that we have a piecemeal approach to looking at importation of zoonotic disease through wildlife trade and live animal imports. The CDC has jurisdiction over known zoonotic agents and the animals that carry them.

So there is some regulatory authority there to regulate, say, the importation of bats for the virus that I just mentioned, Nipah, or rodents because of the monkeypox outbreak that was sparked by the importation of African rodents that led to infection of prairie dogs that were sold as pets, and then infection of people in the Midwest back in 2004. But it is very specific to already established threats.

USDA regulates the importation of animals looking at diseases that threaten livestock health, but doesn't look specifically at wildlife. So from a regulatory standpoint, we still have a big gap in looking across the board at live animal imports and the potential to carry zoonotic viruses. That is something that needs to be addressed.

I wanted to say one more thing before I hand over to my colleagues. CITES has been mentioned a few times as an effective framework for dealing with this issue, but there are a couple of shortfalls, and I agree with Mr. Ashe, that CITES would have to be amended.

No. 1, CITES doesn't address health issues in animals. No. 2, it doesn't cover all the species that are known to be reservoirs for zoonotic viruses, some of which aren't protected or aren't endangered.

Three, it doesn't govern the intranational movement of animals, which can still present a risk for emergence in a market system. These are things that would need to be addressed to make sure that this kind of global convention or treaty would be effective at protecting health.

Senator WHITEHOUSE. Thank you.

My time has expired.

Senator BARRASSO. Thank you, Senator Whitehouse.

Senator Ernst.

Senator ERNST. Thank you, Mr. Chair, and I really do appreciate this topic today. This is very timely or untimely, as Senator Whitehouse just mentioned, but I am glad that we are taking it up.

Illegal wildlife trafficking is a contributing factor to the spread of diseases like COVID-19. It is well known that China is ground zero for trafficked wildlife products. Making the matters worse, unregulated Chinese wet markets oftentimes serve as outlets for the purchase and sale of wildlife that can carry disease.

As we continue to battle COVID-19, we all need to make sure that we are doing what we can to ensure that this never happens again. That is why I have introduced a bipartisan bill that would ban U.S. taxpayer dollars from being spent at China's unregulated wet markets ever again. The Federal Government should not be subsidizing these dangerous, disease prone markets.

For our panelists, many have called for China's unregulated wet markets, and for those that haven't followed this, the wet markets are where wild and domesticated animals are sold and slaughtered for human consumption, to be shut down. We would love to see those shut down, given their role in spreading deadly diseases or viruses that pass from animals to humans, like SARS back in 2003, and now apparently, the novel coronavirus.

The legislation that I introduced with Senator Merkley would ensure that U.S. taxpayer funds are not spent to purchase dogs, cats, birds, or other live animals at these Chinese wet markets, as has been done with taxpayer funds in the past.

For the panel, would you agree that wet markets that sell and slaughter live animals are a danger to public health? If everybody could maybe answer that question and respond why you might see them as a threat to public health.

Catherine, we will start with you, please. Thank you.

Ms. SEMCER. Thank you, Senator.

The markets you describe certainly present a risk. But as was stated in a letter that I signed to the World Health Organization and U.N. Environment Program, along with a number of other researchers, it is really important that we not overreach on this issue.

The experience has been after past outbreaks of Ebola, that when you seek to completely ban the consumption of wild game meat, those bans often fail because this is a cultural issue as much as it is a health issue. What happens is that the trade is then driven underground.

We have seen this happen recently in China with their bans on wet markets. Once the trade is driven underground, you see an increased risk of disease, because the sanitary conditions these animals are kept in often become much worse than they were when the trade was out in the open.

Similarly, if there is a disease outbreak, it becomes much more difficult for researchers to trace the origin of that outbreak, because you are all of a sudden in the criminal netherworld, and people are much less likely to talk with authorities than if the trade was out in the open.

So while they do present a risk, it is important that we not overreach in our attempts to mitigate that risk.

Senator ERNST. Could you agree that U.S. taxpayer funds shouldn't be spent in those wet markets?

Ms. SEMCER. Senator, I am not familiar with the past spending. I have to respectfully decline to comment.

Senator ERNST. Fair enough, thank you.

If you would, Dan, please go ahead, thank you.

Mr. ASHE. Thank you, Senator.

There is no doubt that wet markets, wherever they exist, present a risk. I think the important thing is for us to work internationally to define what constitutes high risk in terms of these markets, and then how do we go about working with the rest of the world to regulate and reduce the risk associated with those markets.

So while I might agree with you on one level about not spending taxpayer money, some ways to reduce the risks may be to work with those countries to provide appropriate refrigeration, or introduce sanitary methods into those markets, recognizing, as Catherine said, it is going to be pretty hard to eliminate a lot of these markets, because they are tied to nutritional needs.

I was in Cusco, Peru, last winter, and they have a classic, what you would call a wet market, in the middle of Cusco, Peru. They are integral to those communities and support for those communities' nutritional needs. So what I think we would need to look at is how can we target our assistance to reduce the risks associated with those markets.

Senator ERNST. I appreciate that, thank you.

And Dr. Epstein as well, please.

Mr. EPSTEIN. Yes, really, I think well stated by Dan and Catherine.

Not much more to add on that, other than to say that what we really need to do to help mitigate risk from these markets, I think, is to one, understand what the high risk animals are that are coming into those markets, and work to improve conditions, eliminate high risk animals from the markets, first of all, improve conditions within the markets. And I think also work to reduce demand for wildlife species that are prone to entering these markets. That is going to take an effort of more sociological outreach and behavioral risk effort.

Just a personal anecdote from working in Liberia in West Africa during, or just after the Ebola outbreak, where there was a ban on the consumption of bats and other wildlife, and in Liberia, bushmeat is the primary source of protein, people were phoning in to the Minister of Health asking when it was OK to eat bats again.

Just because something is outlawed or banned, it doesn't mean the high risk behavior will stop. So I think it is important to really understand that risk.

Thank you.

Senator ERNST. Very good, and I appreciate that. What we do want to see is the stop of those types of products coming, obviously, illegally into the United States, but the spending of taxpayer dollars in those wet markets as well.

So we do believe, a number of us, that we should not be spending Federal Government dollars in those unregulated market areas. Some of you have touched upon ways that we perhaps could improve conditions, work with those governments through various

agencies, so that we don't see the spread, maybe, of those types of viruses to humans.

Again, just building upon what Senator Whitehouse was visiting about earlier, what are those prime agencies that we could utilize to make sure that we don't see Americans infected with those viruses stemming from those wet markets?

Yes, go ahead. Thank you.

Mr. ASHE. As has been mentioned here several times, the Convention on International Trade and Endangered Species is the principal entity in agreement worldwide for the regulation of wildlife trade. As Jon mentioned earlier, it would have to be amended to cover trade in animals that is injurious to human health as well as trade in animals that is injurious to animal health and ecosystem health, but it would provide one overarching agreement.

It would require support from the World Health Organization, from the International Organization for Animal Health, from the Food and Agriculture Organization. So again, it would require an international cooperative framework to bring the appropriate expertise together.

Senator ERNST. OK, fantastic.

I apologize, my time has expired.

Senator BARRASSO. Thank you so very much.

Senator Booker.

Senator BOOKER. Thanks so much, Chairman.

I am grateful for this hearing, and of course to Ranking Member Carper.

Look, I believe the critical lessons we have to learn from the COVID-19 and this incredible pandemic is in order to prevent future pandemics, we need to fundamentally change the way that we interact with wildlife across the globe. Quite simply, there is just no such thing as healthy humans in the absence of healthy animals and a healthy planet. We have been profoundly destructive in a very short period of time.

We are seeing it with us now entering one of the greatest periods of mass extinction we have had on the planet. The deforestation, the habitat destruction that is going on is not just bad for wildlife, it is our own future that we put at risk when we destroy on such a global scale these ecosystems.

The messages from scientists are very clear. In order to protect ourselves from future coronavirus, we must do three things: Stop destroying forests and ecosystems. No. 2: Shut down these live wildlife markets. No. 3 is put an end to wildlife trafficking. These are three globally urgent causes for the future of humanity. To not do this puts our species at serious risk.

In April, Senator Graham and I led a bipartisan letter to the World Health Organization calling for global shutdown of live wildlife markets and the international trade in wildlife.

But let's be clear: This is not just some problem out there in other countries. I know we are in a period of pointing out the extraordinary problem we are seeing in China. But let's understand, this is a global problem, and every country has an important role to play to reduce the risk of future pandemics.

For example, in addition to doing more to eliminate wildlife trafficking in the United States, we must address factory farms, which

present at least as much of a risk to starting a future pandemic as wildlife markets do. We know this because the yells, the consensus of concern, globally, about the overuse of antibiotics, for example, is going to create a super drug that threatens us all.

Mr. Ashe, I am grateful for your testimony. You have already covered a lot of my questions, but I just want to go really quick, if you can, answer these questions in as short and concise a way as possible.

For the U.S. to show global leadership, can you explain more that the Fish and Wildlife Service, what they should be doing domestically and internationally to reduce the risk of future pandemics? What scale of additional resources do you estimate the agency would need in order to be effective?

Mr. ASHE. Well, domestically, I think they need to increase their enforcement of the Lacey Act. I think that they need to enforce the scale of their inspection efforts.

So as wildlife products are coming into the United States, increase the scale and their ability to conduct inspections and increase their ability to do law enforcement investigation, so that we are finding the routes of trade whereby animals are illegally coming into the United States, and then reduce demand.

The United States continues to be one of the world's, if not the world's, largest consumer of wildlife products. So I think the United States Fish and Wildlife Service has to have a multifaceted response: Inspection, law enforcement, demand reduction, conservation, and science to support all of these efforts. I would say the scale of that, it is certainly is in excess of a billion dollars to build that kind of network of support and capacity.

Senator BOOKER. Right. And Mr. Ashe, I am irrevocably focused on China and their very bad actions. But what you just said there, about the role that the United States plays in global wildlife markets, we have serious work to do to step up to this. Live wildlife markets present this profound, unacceptable risk of zoonotic diseases that need to be shut down globally, including here, with the risks we see in the United States.

Can you just talk about the zoonotic disease risks that are present in the entire wildlife supply chain with a little bit more specificity? Again, cogent, because I want to get one more question in, if I can.

Mr. ASHE. OK. So, with a little bit more specificity, I am unsure what you are looking for, except that the volume of traffic in animals, legal and illegal traffic in animals, is enormous. So the U.S. Fish and Wildlife Service, just in terms of law enforcement, and illegal trafficking in wildlife, the general consensus was on a good day, we are inspecting about 10 percent of the volume of traffic that is coming into the United States of animal traffic.

So I think that given the current level of our capacity and investment, we have really kind of no reasonable hope of anticipating and then enforcing restrictions on the importations of dangerous, exotic pathogens.

Senator BOOKER. Right. And you hit on the note I really wanted to get out of that question, which was, in a Nation that I have watched in my short time in the Senate that has spent so much

money increasing enforcement with homeland security, so much money increasing enforcement with customs and border control.

When it comes to the safety and well being of Americans, as we have seen the egregious amount of deaths from a global pandemic, to think that we are only inspecting about 10 percent or enforcing about 10 percent of the legal wildlife trade, not to mention what we need to do on the legal, we are woefully inadequate in doing what we need to be doing to protect American lives.

The last thing I just want to ask you real quick is, Mr. Ashe, could you expand upon your testimony regarding the ways that deforestation and other ecosystem destruction puts us all at risk for future pandemics, and the massive clearing around our country as well as, frankly, the rainforest, going on to support these large demands of animal agriculture?

We are seeing deforestation at levels that are stunning. Why is that such a risk for future pandemics?

Mr. ASHE. Just briefly, as we think about the map that Mr. Epstein put up earlier, and when you think about these biological hot spots, the Amazon Rainforest, the Congo Basin, the Mekong River Basin, these are areas of tremendous biological diversity, including diversity in viral pathogens.

As we are disturbing and disrupting these ecosystems, we are presenting the opportunity for the exchange. We are putting stress on the animals that live there, increasing their susceptibility to disease, and we are introducing pathways for those diseases to be introduced to humans.

So we simply have to do a better job of conserving biological diversity globally, which means conserving the habitat for those animals. The U.S., again, is in a position of not only providing the international assistance to help drive that and build capacities in these countries, the U.S. is also in a position to show leadership by doing more to protect biological diversity here in the United States.

Senator BOOKER. Mr. Ashe, if I can stop you, you are not giving the scale. Are you familiar with the book The Sixth Extinction?

Mr. ASHE. Yes.

Senator BOOKER. Tell me what that book is documenting.

Senator BARRASSO. Senator Booker, you are way over time. We still have three members of the Committee that are waiting to ask questions, so if you could just kind of limit it at this point?

Senator BOOKER. That is my last question, is what is that book documenting and what is actually going on, the scale of it, and I will be done.

Thank you, Mr. Chairman, for your leniency.

Senator BARRASSO. Thank you.

Mr. ASHE. That book documents what is largely a scientific consensus among biologists and ecologists that we are living in the midst of the planet's sixth mass extinction event, and that the things that we are doing globally, humans, in term of our energy development systems, our agricultural systems, are driving this sixth mass extinction.

Senator BOOKER. And that is a threat to humanity itself.

Thank you very much, Mr. Chairman.

Senator BARRASSO. Thank you.

Senator Van Hollen.

Senator VAN HOLLEN. Thank you, Mr. Chairman, and thank you to all the witnesses here today.

To Mr. Ashe, it is good to have a fellow Marylander on the panel. Thank you for your service at the Fish and Wildlife Service.

I have some questions regarding your experience then as it applies to now. We have all heard about the important role the Fish and Wildlife Service can play in combating and regulating international wildlife trade and preventing the spread of zoonotic diseases. One of the Fish and Wildlife overseas programs is the Central African Regional Program for the Environment, known as CARPE for short.

Back in September 2019, in response to allegations of serious misconduct by local law enforcement and park rangers, the Department of Interior froze funding for the program, an action that I strongly supported. Because we need to make sure that our funds are targeted to the right people and the right organizations to do the job.

I am concerned, however, that the department has not developed an alternative use for those funds aiming at the earlier objectives with respect to international conservation. And I do believe that the fact that that program is lapsing does raise a risk with respect to the issues that we are talking about today.

Can you speak to that particular program, as well as other international programs? But start with that one.

Mr. ASHE. The Central Africa Regional Program for the Environment has been an enormously successful effort, and funds many things, including law enforcement, anti-poaching patrols, and efforts like that. As you said, Senator, we need to increase our diligence to ensure that those kinds of activities are done in a way that is respectful of human rights and community prerogatives. So as you said, I would agree on that.

But the larger part of the CARPE Program and U.S. international assistance in general has been aimed at developing capacity within these countries, capacity to analyze the environmental effects of economic development, to protect, to set aside protected areas in countries like Gabon, which has been a world leader in marine protected reserves.

So if the department has concerns about the CARPE Program, then it should put in place the mechanisms to ensure those grants are reviewed to minimize the likelihood there will be human rights violations. To my knowledge, they haven't done that, and they are putting at risk close to $40 million of assistance that could be going to these countries to support the kinds of things that we have been talking about at this hearing.

Senator VAN HOLLEN. Well, I appreciate that, and I have raised this issue directly with Secretary Bernhardt. We have not gotten a satisfactory response as to what their alternative plans are with respect to those funds. I hope to work with the Chairman and Ranking Member on this Committee to get that sorted out.

In the remaining time, can you talk to the intersection of climate change and the spread of zoonotic diseases? Clearly, a lot of the changes we are seeing in our climate impact animal migrations as well as other animal behavior, and bring them in closer contact

with humans. We are talking about wildlife here. Can you talk about the intersection of those two issues?

Mr. ASHE. Sure. I think climate change, as Senator Booker asked previously about the sixth mass extinction, I think climate change is a kind of an overlying or underlying cause of disruption and stress in ecological systems and stress in animals. That increases the likelihood, the incidence of disease and the likelihood of transmissions of disease between animals, between populations of animals, and between animals and humans.

As with many other things, climate change and the global disruption, ecosystem disruption that we are seeing as a result of rising climate, is going to increase the incidence, the risk, the frequency of disease transmission. So as part of our efforts to save ourselves and hopefully save ourselves from a future pandemic, we need to turn our attention increasingly to climate change and solving that.

Senator VAN HOLLEN. Thank you. Mr. Chairman, thank you for holding this hearing, and that is the end of my questions.

Senator BARRASSO. Thank you, Senator Van Hollen.

Senator Cardin.

Senator CARDIN. Thank you, Mr. Chairman, and let me thank all of our witnesses. This has been a particularly important hearing.

We all know that we have a challenge. We have a challenge because of wildlife trafficking, we have a challenge, as Senator Van Hollen points out, because of climate change, we have a problem because of conflict between human life and animal life has become more challenging over time.

COVID-19 has gotten the international attention that we are all in this together and that we need to be more aggressive in dealing with this issue. We now have the global attention.

Each one of you has pointed out that U.S. leadership is indispensable in helping to deal with this challenge, and yes, we can learn from best practices of other countries; we can look at what has worked in this country, and we can refine those tools. We have talked about that during this hearing.

But I am wondering whether we should have a bolder approach. Since we are in this pandemic, and we have the attention of the global community, should we be looking at a new treaty? Should we be looking at some form of enforceable international commitments to deal with wildlife trafficking and the spread of animal borne diseases that affect us, our human life? Is this the time that we should be looking to initiate a global response to control these activities?

If any one of the three of you want to respond, that is fine with me.

Mr. ASHE. Thank you, Senator Carper. I will just reiterate as I have said previously that I do believe we need a new, amended Convention on International Trade in Endangered Species, and so it could be a Convention on International Trade in Endangered and Injurious Species.

The thing about CITES is that it is enforceable among the parties. You have an enforceable, international agreement.

So I think that presents the greatest potential for us to address this issue, do it as promptly as possible, and build an international

organization that has competence and capacity in the trade of wildlife.

Senator CARDIN. Thank you.

Mr. EPSTEIN. I would add, in support of what Dan was saying that CITES would be a good basis for developing additional scope.

But I think in addition to a legal framework, we need to redouble our commitment to strengthening systems outside of the United States, and particularly in parts of the world and countries that are vulnerable to disease emergence, where wildlife trade and trafficking occurs as one of the risk factors, and to really make sure that there are systems in place that can rapidly detect and respond to the emergence of a novel pathogen that likely comes from wildlife. That is going to ultimately allow us to contain outbreaks before they become global pandemics like COVID-19.

That is something that is really incumbent upon us, is having resources to help countries strengthen those systems. It is going to protect us. The cost, the investment required to do something like that, is a tiny, tiny fraction of what the damages have been already from COVID-19 and will continue to be. So these are investments we should be thinking to make beyond just policy.

Senator CARDIN. Mr. Epstein, can you identify a country other than the United States that you think has been the strongest and has the best model for us to take a look at in that regard?

Mr. EPSTEIN. Sure. There are a number of countries that have now been establishing One Health frameworks at a policy level, that is formal, codified relationships between ministries of health, ministries of livestock, of agriculture, and ministries of environment that include wildlife agencies.

One example that is been particularly progressive is actually Bangladesh, which is a relatively small country, but it has responded to zoonotic disease outbreaks like Nipah virus and avian influenza and anthrax by really rallying around those and recognizing the need for coordinated surveillance and response.

That is one example. There are other countries, too, that are building such frameworks in Southeast Asia and in Africa, starting to really bring together those three sectors of human health, domestic animal, and wildlife. I think that is a model we need to encourage and continue to support.

Senator CARDIN. Thank you.

Mr. Chairman, I look forward to working with you and other members of the Committee. This is an area where I think we can make some strong progress. Thank you for having this hearing.

Senator BARRASSO. Thank you very much, Senator Cardin.

As I turn to our Ranking Member, I just point out to our three witnesses, we have had over 13 members of the Committee participating by video and asking questions.

Dan, you have been at a number of these Committee hearings, that is a pretty impressive turnout of this Committee, which shows how much interest there is in this topic.

Senator Carper.

Senator CARPER. All the more remarkable, we only have 12 members.

[Laughter.]

Senator CARPER. I don't know where these extra people are coming from. We could have sold tickets for this one.

I want to apologize again to Catherine Semcer, to Jonathan Epstein, and to Dan Ashe for being absent for much of the last hour. I serve as the senior Democrat on the Environment and Public Works Committee, but also the committee called Homeland Security and Governmental Affairs. We were marking up, I don't know, a couple dozen bills and nominations, so I am wearing two hats at once. I am not doing it all too well, but hopefully, things seem to have proceeded very nicely here in my absence. Not surprisingly.

A number of the questions that I was prepared to ask have been asked. I will try not to ask them again, but one, again, thank you for not just for being here, but for answering the questions and for your testimony, but also for what you do with your lives. We are grateful to you for that and have been for some time.

The first question I want to ask deals with the impact of COVID-19 on the AZA members. I was told by Elizabeth Mabry, who may be sitting behind me, about AZA. I thought that used to be a sorority at Ohio State, but as it turns out, it is also the Association of Zoos and Aquariums, so that is a twofer, I guess, Dan.

Here is the question, though. While this question is on the periphery of the issues that our Committee is considering today, I don't want to pass up the opportunity to ask it.

We know that the current coronavirus pandemic has seriously impacted zoos and aquariums. These facilities have unique needs. We are proud to have an AZA accredited zoo in Delaware, which contributes to wildlife conservation efforts and is an educational beacon in our State, and one that we hope to improve even more in the next year or two.

My question would be this: Would you elaborate, Dan, on the impacts of the current pandemic on zoos and aquariums? How could these impacts harm conservation efforts, particularly for endangered and imperiled species?

Thank you, go ahead.

Mr. ASHE. Thank you, Senator Carper. AZA is an accrediting body. In order to be a member, you must be accredited. We have 240 accredited members, mostly here in the U.S., but in 13 countries across the globe.

The pandemic has been devastating for them, because they are businesses more than anything else, they are businesses. They rely on earned revenue to do the work that they do, and that earned revenue comes from something that we call a guest or visitor.

In a typical year, our members would welcome more than 200 million visitors, or guests, which is more than all professional sports combined here in the United States. So they are under severe financial distress right now.

The effect of that on conservation is that our members collectively, also in 2019, our members spent $232 million in direct support for field conservation. So coming into 2020, I suspect that contribution to conservation is going to decline precipitously, because our members are missing the key ingredient in supporting that conservation, which is gate revenue, visitor based revenue. They are under severe stress.

These are organizations which play a key role in supporting the Federal Government's effort in saving animals from extinction, whether it is the Wyoming toad or the black-footed ferret, or the California condor, or the West Indian manatee in Florida, or sea turtles.

Whether it is mountain gorilla in Uganda and Rwanda, our members are doing conservation all over the world, and they are supporting efforts at sustainable and healthy interactions between humans and wildlife.

So without that key economic ingredient, which is earned revenue, the ability of our members to support that is going to be dramatically reduced.

Senator CARPER. All right, thank you.

I think the issue of stress has been raised by a couple of my colleagues already, but I want to return to it just for a moment. Stress appears to be a key factor in an animal's susceptibility to disease, and therefore its likelihood of transmitting disease to other species, including us, human beings.

Question: Would you elaborate on the role of—this is for Dr. Epstein—would you elaborate on the role of stress in animal disease transmission? What factors contribute to the stress experienced by traded animals? What might we be able to do as a Nation to reduce levels of stress with respect to our live animal import practices?

Dr. Epstein, please.

Mr. EPSTEIN. Thank you, Senator Carper. That is a great question.

Generally, speaking, stress, just like in people, causes immune suppression. When an animal or person is under stress, their immune system doesn't function as well. If they are already infected with, say, a virus, their ability to clear that virus from their system is impaired.

What that can translate into is increased or prolonged shedding or transmission of that virus. So an animal under stress that is the host for a zoonotic virus may shed that virus for a longer period of time or at greater quantities, because it simply isn't able to get rid of it. That is directly one way that stress can influence risk of zoonotic disease transmission.

Wildlife trafficking is a particularly stressful activity for the animals involved. They are often contained in tiny little cages. Many times multiple animals are packed together. If one of them is shedding, they all get exposed.

Importantly, a lot of times in the trafficking route, the value chain to markets, multiple species are interacting with each other, and so animals that in nature would never normally interact have the opportunity to exchange pathogens like viruses. This can lead to viral mutation; it can lead to adaptation.

Then when people are thrown into the mix, like in trafficking activities, they can then be exposed to animal pathogens that have the ability to infect people.

So stress plays a big role. It is not being well studied directly, in other words, it is hard to say how much stress or what the cutoff is. But generally speaking, the conditions that animals are kept in as part of the illegal wildlife trade and sometimes legal wildlife trade contribute to the stress of those animals in transport.

Senator CARPER. I think you said that when I asked my question, you said that was an important question. You gave a very good answer; that was illuminating.

I have one last question Mr. Chairman, if I could. I would just like to briefly ask our witnesses about citizen engagement. Do we have time? Thank you.

I would say to each of our witnesses, and I would like to start with Catherine Semcer on this.

You have spent a fair amount of time talking about the role of governments in preventing future zoonotic disease outbreaks and pandemics.

My question would be this: What can U.S. citizens, do to help? What can U.S. citizens, do to help? Are there steps the U.S. Government in partnership with other governments is already taking or can take to educate our public on threats of wildlife trafficking to conservation and human health and safety? How can we help?

Catherine.

Ms. SEMCER. Well, thank you for that question, Senator. We spent a great deal of time discussing how to better oversee wildlife trade and how to interdict wildlife that is being trafficked.

But I always go back to the U.S. national security strategy and its goal of containing biothreats at their source. In this context, that means maintaining healthy, functioning ecosystems.

In my written testimony, I have supplied a map that shows the overlap between the world's remaining large unroaded areas and likely points of zoonotic disease outbreak. I have also discussed extensively the role of Chinese investment in facilitating the deforestation of areas like the Congo Basin, where the risk of zoonotic disease spillover is very likely.

I have also discussed the role that the U.S. consumer market plays in this deforestation. While a lot of the raw logs are going to China, that wood is then turned into products which are ultimately shipped to the United States.

American citizens decreasing their demand for tropical hardwoods is absolutely essential to guaranteeing our biosecurity and our health security going forward. Limiting our consumption of tropical hardwoods from places like Africa is even more critical. So anything we can do to change that pattern of consumption to facilitate forest conservation in places like the Congo Basin, is going to be a step in the right direction.

Senator CARPER. Thank you, ma'am.

Dr. Epstein, please.

Mr. EPSTEIN. In the United States, one of the main drivers of animal importation is the pet industry. I think it is really important that people do have a relationship with animals by having pets, and stay connected to them.

But consumer education and making sure that our consumers are aware of the importance of domestically bred exotic species as opposed to those that are pulled from the wild through less diligent agencies that are selling animals would be an important step to limiting risk.

Also, helping American consumers be aware of the potential risk for zoonotic pathogens coming in with certain animal species. So

making sure that educations and outreach is part of helping to control consumer demand for exotic animals.

Senator CARPER. Thank you for that response.

We have one last question. Same question for Dan Ashe, please.

Mr. ASHE. Senator Carper, I will come back to the Association of Zoos and Aquariums and our 200 million visitors. I think there is a great opportunity to educate the public and increase the awareness amongst the public about what is happening globally, about the kind of ecosystem degradation that is happening globally, and what the United States of America can do to help stop that.

Joining in campaigns like the Campaign for Nature, as I said, to save 30 percent of nature for biodiversity by 2030, is a great opportunity to explain to the public the importance and the need for biodiversity conservation and the related importance to human health.

I think education about responsible behavior; the Association of Zoos and Aquariums is the home of the Wildlife Trafficking Alliance, which is an alliance of more than 80 organizations including corporate organizations, as well as zoos and aquariums. One of their major endeavors is to increase awareness amongst the public about wildlife trafficking and what individuals can do to help stem the epidemic in wildlife trafficking.

All of these efforts require engagement and leadership from the U.S. Government and support for efforts at education and awareness building and demand reduction and compliance, so that normal citizens can help us with compliance. So I think we are in great need of additional Federal investment and resources to support all of these efforts.

Senator CARPER. All right, thanks.

Thank you all. It was great to see you, and thank you again for your good work and for joining us today, both in person and from afar. Thank you.

Mr. Chairman, thanks.

Senator BARRASSO. Well, thank you.

If there are no more questions from members today, they may, as you know, submit questions for the record, so the hearing record will remain open for 2 weeks.

I want to thank the three of you for being here, Ms. Semcer, Dr. Epstein, Mr. Ashe. Terrific testimony, great insight. Obviously you generated a lot of interest from members of the Committee, and we are grateful for your time and your testimony.

Senator CARPER. Mr. Chairman, I have one UC request, if I could, before we adjourn, please. Thank you.

Senator BARRASSO. Please.

Senator CARPER. I ask unanimous consent to enter into the record supplemental materials from stakeholders with interest in zoonotic disease and wildlife trade. Thanks.

Senator BARRASSO. Without objection.

[The referenced information follows:]

Date: July 21, 2020

To: United States Senate Committee on Environment and Public Works

RE: Hearing Entitled "*Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking"*

From: The Congressional Sportsmen's Foundation
Jeffrey S. Crane
President

Dear Chairman Barrasso, Ranking Member Carper, and Members of the Committee:

I write today to express the support of the Congressional Sportsmen's Foundation (CSF) for the Committee's efforts to call attention to critically important conservation issues through the hearing entitled "*Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking*."

Established in 1989, CSF works with the Congressional Sportsmen's Caucus (CSC), the largest, most active bipartisan caucus on Capitol Hill with nearly 250 Members of Congress from both the House and Senate. Fifteen years ago, CSF extended the legislative network from Washington, DC to states across the country, establishing the bipartisan National Assembly of Sportsmen's Caucuses, which today is made up of 49 state legislative caucuses, and includes over 2,500 legislators. Ten years ago, CSF established a bipartisan Governors Sportsmen's Caucus, which includes more than half the governors from throughout the country. Together, this collective force of bipartisan elected officials works to protect and advance hunting, angling, recreational shooting and trapping for the nearly 40 million sportsmen and women who spend $90 billion annually on our outdoor pursuits.

This hearing offers a unique opportunity to meet the urgent need to combat illegal wildlife trade and inappropriate uses of wildlife while ensuring that preventative measures to curb the spread of future zoonotic diseases do not undermine the livelihoods of millions of people across the globe who rely on natural resources, including wildlife, as a means of survival. CSF believes that any legislative proposal to curb the spread of future zoonotic diseases must account for the benefits of wildlife trade, including well-regulated and sustainable hunting, on ecosystem conservation, food security, and attainable law enforcement standards.

The Congressional Sportsmen's Foundation recognizes that wildlife trade, food security, and zoonotic disease control are extremely complex issues and we applaud the Committee for taking a leading role in trying to resolve these issues. However, CSF is concerned that some policy responses to the COVID-19 pandemic have the potential to undermine some of the most highly

successful conservation practices while concurrently undermining human resource and food security needs in some of the most remote locations in the world. Hunting, both domestically and abroad, has a strong track record of providing local incentives for the conservation of wildlife while simultaneously benefiting local livelihoods. Before any legislative proposals are drafted, we encourage the Committee to consult with domestic and international wildlife conservation professionals including but not limited to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the International Union for Conservation of Nature (IUCN), and the U.S. Fish and Wildlife Service (FWS). CITES, the IUCN, and the FWS all recognize and credit sustainable hunting programs as a cornerstone of domestic and international wildlife conservation. CSF believes that any law or legislative proposal that discourages rather than facilitates these hunting-conservation programs will have an adverse impact on sound ecosystem conservation and food security around the globe.

Well-regulated and sustainable hunting not only provides significant benefits for ecosystem conservation, but also provides significant food security benefits for people living in remote areas where access to common food markets may be limited or non-existent. We believe that proposals to prevent the spread of zoonotic diseases should encourage thorough and proper consultation between CITES, the IUCN, and FWS and the world's leading public health organizations including the Centers for Disease Control (CDC), World Health Organization (WHO), Food and Agriculture Organization (FAO), among others leading organizations to ensure a strong balance between wildlife conservation, ample food security, and the prevention of future zoonotic diseases.

While all legislative efforts to prevent the spread of future zoonotic diseases deserve thoughtful consideration, we believe some efforts may take unnecessary and duplicative steps that will overcomplicate and undermine the highly successful programs and laws already in place. In order to combat zoonotic diseases, we must account for law enforcement standards to curb illegal wildlife trade using the current programs that are available to our law enforcement agencies. CSF believes the Committee should strongly consider an authorization to increase funding for the U.S. Fish and Wildlife Service's International Affairs program and the Multinational Species Conservation Fund to address illegal trade while avoid any unwarranted impacts on sustainable and ethical hunting programs.

Being mindful of the concerns raised above, the Congressional Sportsmen's Foundation thanks the Chairman Barrasso, Ranking Member Carper, and members of the Committee for holding this important hearing. We encourage the Committee to be mindful of the concerns raised above when developing legislative proposals to combat the spread of future zoonotic diseases.

Sincerely,

Jeffrey S. Crane
President

July 22, 2020

Senator John Barrasso
Chairman
Environment and Public Works Committee
410 Dirksen Senate Office Building
Washington, DC 20510

Senator Tom Carper
Ranking Member
Environment and Public Works Committee
456 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Barrasso and Ranking Member Carper:

On behalf of the International Fund for Animal Welfare, Animal Welfare Institute, Humane Society Legislative Fund, and our members nationwide, thank you for holding today's hearing *Stopping the Spread: Examining the Increased Risk of Zoonotic Disease from Illegal Wildlife Trafficking*. We are currently living an object lesson in the dangers of trading in wild animals. To date, COVID-19 has killed more than 600,000 people globally, sickened tens of millions, and crippled economies around the world. The virus is thought to have originated in a live wildlife market in China, where multiple species were being slaughtered and sold for human consumption. But COVID-19 is not the first novel pathogen to emerge as a result of wild animal consumption and wreak havoc on human health. In just the past 40 years, the worst pandemics and epidemics have all originated with the trade and consumption of wild animals amid the destruction of their habitat, including AIDS, SARS, and Ebola.

Scientists caution that live wild animal markets create the perfect conditions for novel zoonotic diseases to develop and spill over from wildlife to human populations, because they bring together multiple wild species in crowded environments that promote the mixing, propagation, and dispersal of pathogens – especially through body fluids – in unnaturally close proximity to humans. However, live wildlife markets are not the only operations that create these environments and consequently endanger public health. Any industry that institutes animal handling and housing practices where animals are kept in unnaturally close quarters to each other and to humans is at significant risk for facilitating disease outbreaks. Wild animal farming is a prime example of such an industry that poses a significant risk of emerging zoonotic pathogens and spillover into human populations.

When wild animals are bred, brought into, or held in farmed situations (especially if conditions are crowded and unsanitary), their stress levels will increase over extended periods of time, making them more susceptible to contracting and spreading disease. Stress response hormones in humans and animals are powerful suppressants of the immune system. In fact, stress can affect patterns of disease in wild populations, such as by making koalas more susceptible to chlamydia infections,[1] bats more vulnerable to Ebola virus infections,[2] and migratory birds more prone to avian influenza.[3] Stress can cause latent infections to recur and viral shedding to increase,[4] heightening the risk of disease transmission to other animals and humans. For those animals that are wild-caught and brought in to replenish populations or breeding stock, there is again the heightened risk of exposing the farmed population and humans to new pathogens.

Wild animal farming also raises welfare concerns for species that are not appropriate for domestication of any sort. The increased population density of wildlife on farms, along with exposure to humans and potentially unfamiliar species, contribute to both wildlife stress and artificial conditions ripe for infection of both humans and the animals. For example, it was found that infected workers at a mink fur farm in the Netherlands transmitted SARS-CoV-2 to the farmed mink population.[5] The disease quickly spread due

to the crowed, stressed conditions and eventually jumped back to other workers as well as feral cats on the property. Sadly, this event has resulted in the culling of over 500,000 mink.[6] It is vital to highlight that it is not the animal that poses the risk, but rather the conditions and situations we create through our exploitation of wildlife.

Trade of live wild animals adds another layer of stressors and artificial opportunities for exposure, including during capture or transport, inhumane conditions, contact with unfamiliar animals in markets, and slaughter.[7] Poultry farms and live food markets around the world have already demonstrated these risks through multiple outbreaks of the Highly Pathogenic Avian Influenza (H5N1).[8] By creating these outbreak-prone conditions and pressures on wildlife in farms and by further facilitating the wildlife trade, wild animal farms are poised to be the next epicenter of zoonotic diseases outbreak.

Wild animal farms also often serve as cover for the laundering of wild-caught species, so in addition to posing a direct threat to human health, wild animal farms may actually increase poaching and illegal trafficking.[9] In 2016, an exhaustive review of the impacts of wild animal farming on conservation found that wild animal farms are unable to meet current demand for wild species, and often actually increase demand for wild animals by reducing stigmas associated with wild animal consumption.[10] Furthermore, it has been demonstrated that consumers often prefer wild-caught to farmed wild animals, meaning that farmed wild animals, while potentially increasing demand for each species overall, do not replace the demand for poached individuals.[11]

Ultimately, the emergence of COVID-19 is due to human activity, specifically the trade in wild animals. Given the immense human and economic cost of this virus and other wildlife-borne pathogens, we cannot afford to simply shift from trade in wild-caught individuals to those bred in captivity. Instead, we should focus efforts on reducing demand for wild animals overall, eliminating wildlife trafficking, and strengthening conservation efforts.

Again, thank you for your attention to this important matter.

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[1] Narayan, E. 2019. Physiological stress levels in wild koala sub-populations facing anthropogenic induced environmental trauma and disease. *Scientific Reports* 9: 6031. https://https://doi.org/10.1038/s41598-019-42448-8.

[2] Leroy, E.M. et al. 2005. Fruit bats as reservoirs of Ebola virus. *Nature* 438: 575–576.

[3] Feare, C., 2010, Role of wild birds in the spread of highly pathogenic avian influenza virus H5N1 and implications for global surveillance, *Avian Diseases* 54 (s1): 201–212, https://doi.org/10.1637/8766-033109-ResNote.1; McMichael, L., Edson, D., Smith, C. et al., 2017, Physiological stress and Hendra virus in flying-foxes (*Pteropus spp.*), Australia, *PLoS ONE* 12 (8): e0182171, https://https://doi.org/10.1371/journal.pone.0182171.

[4] Kreuder Johnson, C., Hitchens, P. L., Smiley Evans, T. et al. 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. *Scientific Reports* 5: 14830. https://doi.org/10.1038/srep14830.

[5] Oreshkova Nadia, et al. SARS-CoV-2 infection in farmed minks, the Netherlands, April and May 2020. *Euro Surveill.* 2020;25(23):pii=2001005. https://doi.org/10.2807/1560-7917.ES.2020.25.23.2001005

[6] Id.

[7] Kreuder Johnson, C., Hitchens, P. L., Smiley Evans, T. et al. 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. *Scientific Reports* 5: 14830. https://doi.org/10.1038/srep14830.

[8] U.S. Department of Health and Human Services, Center for Disease Control, *Highly Pathogenic Asian Avian Influenza A(H5N1) Virus,* available at: https://www.cdc.gov/flu/avianflu/h5n1-virus.htm.

[9] Tensen, Laura. 2016. Under what circumstances can wildlife farming benefit species conservation? Global Ecology and Conservation 6 (2016) 286–298. https://doi.org/10.1016/j.gecco.2016.03.007.

[10] Id.

[11] Id.

Animal Legal Defense Fund • Center for Biological Diversity • Defenders of Wildlife • Dian Fossey Gorilla Fund • Endangered Species Coalition • International Fund for Animal Welfare • Natural Resources Defense Council • Ocean Preservation Society • The Bonobo Conservation Initiative • Western Watersheds Project • WildEarth Guardians

COVID-19, the disease caused by a novel coronavirus of zoonotic origin, has wreaked havoc on the global community. The social and economic impacts of the current pandemic crisis will be felt far into the future, and life for many will not be the same. In the United States, we have seen this illness strike unrelentingly the most vulnerable members of our society. This includes those with underlying chronic health conditions such as Type 2 Diabetes, cardiovascular disease, and autoimmune disorders in communities that have less access to healthcare services. Even as policy makers respond to the daily needs of people affected by the virus, and facilitate efforts to find a cure, we must also look ahead, to reduce the chances of another pandemic caused by a zoonotic spillover event.

The undersigned organizations and individuals urge leaders around the world to move swiftly to protect us all against future pandemics and diseases of wild animal origin. We suggest that the following principles guide what must be a sustained and coordinated effort:

- While the novel coronavirus that causes COVID-19 originated in wildlife[1], the proximate cause of the current pandemic was human behavior: our exploitation of wildlife, among other things, may have created the opportunity for a novel virus to jump from wildlife to human beings. That virus has spread from person to person, and around the world.

  The risk for zoonotic illness to spill over into the human population can be created by human interactions with wildlife, including:
  - Operating live wildlife markets[2];
  - Consuming wildlife, wildlife parts, or wildlife products, and preparing wildlife for consumption;
  - Keeping wild animals as pets;
  - Handling wild animals in commercial trade; and
  - Destroying wildlife habitat.
- These activities not only lead to direct interactions between humans and wild animals, they also create conditions that make disease transmission more likely because:
  - Animals that are stressed[3] from the process of capture, transport, habitat destruction, or food insecurity are more likely to shed viruses in a way that can lead to spillover[4];
  - Bringing different species into closer contact with one another at live wildlife markets, or through other means, including habitat encroachment, can allow viruses to jump from one species to another, including humans[5]; and
  - Reducing biodiversity and the destruction of or encroachment into wildlife habitats, particularly in tropical forests, can increase the likelihood of diseases spilling over into human populations[6].
- To prevent wildlife-borne zoonotic disease spread to humans and reduce the risk of future zoonotic pandemics, initiatives should focus on:
  - Reducing consumer demand for wildlife for consumption and as pets;
  - Reducing commercial trade in wildlife;

- Eliminating wildlife trafficking;
- Increasing funding for implementation and enforcement of wildlife protection laws in the United States and for international collaborations to protect wildlife;
- Closing live wildlife markets;
- Protecting wildlife in wild habitats;
- Protecting and connecting wild habitats so biodiversity can thrive;
- Significantly increasing support for conservation programs, both domestically and internationally;
- Incorporating a One Health[7] approach into conservation and public health policies;
- Establishing and supporting longitudinal interdisciplinary global research programs to understand and track wildlife biomes and related human health factors; and
- Addressing poverty and associated problems, including food and resource insecurity, that contribute to habitat destruction, wildlife exploitation, and biodiversity loss.

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[1] In this document, the term "wildlife" refers to wild animals, regardless of whether they are captured from the wild or bred in captivity.

[2] Live wildlife markets often involve the commingling of wildlife acquired from wild habitats with other live animals, including those species traditionally labeled as livestock, which are also vulnerable to zoonotic infections. This coalition is focused on wildlife, which includes exotic species that might be farmed, sold, and consumed in these markets.

[3] Wildlife that is sold in live animal markets is acquired through the destruction of wild habitats or through the captive breeding of exotic species. The process of chase, capture, and transport from the wild to markets where wildlife are often held in cramped cages and slaughtered amidst conspecifics and consumers causes stress to animals, is arguably inhumane, and can increase susceptibility to pathogens. *See for example*: Hing et al. (2016) https://researchrepository.murdoch.edu.au/id/eprint/30933/1/relationship-between-physiological-stress-and-wildlife-disease.pdf and Plowright et al. (2008) https://royalsocietypublishing.org/doi/full/10.1098/rspb.2007.1260

[4,5,6] National Research Council (US) Committee on Achieving Sustainable Global Capacity for Surveillance and Response to Emerging Diseases of Zoonotic Origin; Keusch GT, Pappaioanou M, Gonzalez MC, et al., editors. Sustaining Global Surveillance and Response to Emerging Zoonotic Diseases. Washington (DC): National Academies Press (US); 2009. 3, Drivers of Zoonotic Diseases. Available from: https://www.ncbi.nlm.nih.gov/books/NBK215318/.

[7] One Health is a collaborative, multi-sectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes by recognizing the interconnection between people, animals, plants, and their shared environment. More information is available at https://www.cdc.gov/onehealth/index.html.

National Wildlife Federation Recommendations to Congress for Strengthening the U.S. Response to Wildlife Diseases

April 30, 2020

Wildlife diseases present a serious risk to our nation's people, wildlife populations, biosecurity, food security, and economy. The threat from wildlife diseases is greater than ever in an increasingly globalized world that is also managing the realities of a changing climate. Zoonotic diseases, those that are passed from animals to humans, account for more than half of known infectious diseases in humans.

Responding to outbreaks of fish and wildlife diseases requires the mobilization of people and resources as well as coordination across federal, state, and tribal agencies and other partners. It also requires resources that match the scale of the problem. The United States is lacking on both fronts and needs to move aggressively to better fund, coordinate, and implement to detect and respond to existing and emerging wildlife diseases. Strategic investments will protect the health of Americans and our nation's diverse fish and wildlife. We urge Congress to take the following steps to improve America's ability to respond to the growing threats from wildlife diseases.

PLUG GAPS IN GOVERNMENT AUTHORITIES FOR ADDRESSING WILDLIFE DISEASES

Although existing and emerging wildlife diseases pose increasing threats to wildlife and public safety, major gaps in government authorities and programs constrain our ability to prevent the introduction of new diseases, control existing wildlife diseases, and minimize the potential for pathogens to spread among wildlife populations and from wildlife to humans. For instance, although emergency authorities for diseases of humans and domesticated livestock exist (within HHS and USDA respectively), no comparable emergency authority exists for responding to emerging wildlife disease epidemics. Similarly, live animals currently can be imported into the United States without adequate screening for the risks they may pose to the nation's wildlife, ecosystems and economy. Congress has the opportunity to plug many of these gaps by advancing the following three bills:

- **Advancing Emergency Preparedness Through One Health Act** (S. 1903, H.R. 3771), was introduced by Senators Smith (D-MN) and Young (R-IN), and Representatives Schrader (D-OR) and Yolo (R-FL). This bipartisan bill is focused specifically on improving the U.S. response to human and animal health emergencies. It expands upon existing federal programs, such as CDC's One Health office and USDA APHIS' One

Health Coordination Center by requiring the Department of Health and Human Services (HHS) and the USDA to create a One Health Framework in coordination with other agencies. It will improve workforce development on prevention of and response to disease outbreaks in animals and humans, and increase coordination and scientific understanding among agencies who study human, animal and environmental health.

- **Wildlife Disease Emergency Act**, introduced in the 115th Congress as H.R. 7005, would help federal, state, and tribal agencies prepare for, identify, and respond to wildlife disease emergencies. Notably, the WDEA would establish a rapid response fund for wildlife disease. It would also give the Interior Secretary authority to declare wildlife disease emergencies and coordinate responses, with input from a diverse Wildlife Disease Committee. We recommend Congress reintroduce this legislation and fund it at $25 million.
- **Lacey Act Modernization.** The Lacey Act regulates the importation of injurious species into the United States and is a primary means for preventing the introduction into the U.S. of harmful invasives species, including wildlife diseases. Unfortunately, designation of injurious species under the Act is so time-consuming and inefficient that there are few restrictions on live animal importation into the United States, even those that are potentially harmful. To stop the unfettered flow of potentially risky species into the U.S., there is an urgent need to modernize the Lacey Act's injurious species provisions, which could be accomplished through passage of the Invasive Fish and Wildlife Prevention Act.
    - **Invasive Fish and Wildlife Prevention Act,** introduced in the 115th Congress as H.R. 6362 would streamline and strengthen regulations designed to prevent the introduction and spread of injurious species and/or species that could cause harm to human or wildlife resources. The bill would enhance the ability of the U.S. Fish and Wildlife Service to carry out risk assessments and expedite injurious species listings, and would give the Service clear authority to make emergency temporary designations of wildlife species that pose an immediate threat to the United States. This legislation aims to cover some of the costs of injurious species prevention through the establishment of an Injurious Wildlife Prevention Fund. We recommend Congress reintroduce this legislation and fund it at $50 million.
    - **Reinstate prohibitions on interstate transport of injurious species.** The U.S. Fish and Wildlife Service traditionally has interpreted the Lacey Act as not only prohibiting the importation of injurious into the United States, but also prohibiting the interstate transport of these harmful species. A recent court decision, based on a semantic drafting error in the law, overturned that interpretation, holding that Act does not ban transport of injurious wildlife between States within the continental United States. This absurd interpretation of the law must be corrected by amending and clarifying the relevant portion of the statute in order to reinstate interstate prohibitions on the transport of injurious species.

INCREASE CAPACITY OF EXISTING PROGRAMS TO RESPOND TO WILDLIFE DISEASE

Enhancing capacity of existing programs designed to prevent, detect, and mitigate the spread of wildlife disease is an important and immediate step that will increase our nation's security. Of particular importance are the relatively few federal agencies that have specific mandates for wildlife disease surveillance, research, and control, such as the U.S. Geological Survey's National Wildlife Health Center and USDA Animal Health Inspection Service's (APHIS) National Wildlife Disease Program. Robust funding for key federal programs addressing wildlife disease include:

- $101 million in new construction funding is needed to modernize the antiquated facilities of the National Wildlife Health Center (NWHC). Additionally, $36 million in annual funding for the USGS Biological Threats program (an increase of $10M), which includes NWHC operations, would allow the Center to scale up its surveillance, monitoring, and research efforts.
- $10 million to the US Fish and Wildlife Service for their collaborative work on wildlife diseases affecting U.S. species, such as chronic wasting disease, white-nose syndrome in bats, West Nile virus, avian malaria, ranaviruses and fungal diseases in amphibians and reptiles, and rabies, brucellosis and plague in mammals. Funding should specifically be provided to FWS' Science Applications, law enforcement, and veterinarian programs, and Wildlife Health Office within the National Wildlife Refuge System.
- Increase funding for key programs implemented by the Animal and Plant Health Inspection Service (APHIS) targeting the following existing wildlife diseases:
    - $15 million for the Equine, Cervid, and Small Ruminant Health Program for cooperative agreements with state wildlife agencies for monitoring, testing, research, and surveillance of Chronic Wasting Disease. In FY20 this program received $5 million in funding.
    - $6 million in additional funding to APHIS to control sylvatic plague in prairie dogs and black-footed ferrets.
- Increased funding for key programs implemented by the Department of Interior and Bureau of Indian Affairs to enhance the capacity of Tribal nations to manage programs and coordinate with other agencies and partners on wildlife disease issues.
    - $12 million to the Department of Interior for the Bureau of Indian Affairs Invasive Species Program. This program received $5.4 million in FY20.
    - $10 million to the Department of Interior for the Bureau of Indian Affairs for the Wildlife and Parks Tribal Priority Allocation.

CREATE A COHESIVE RESPONSE TO CHRONIC WASTING DISEASE

Chronic Wasting Disease (CWD) is a prion-based disease that poses a direct threat to deer, elk, and moose populations, to rural economies, and to the primary funding mechanism for state

wildlife agencies. We recommend Congress pass a package of three CWD bills to create a cohesive response to this rapidly spreading disease.

- Chronic Wasting Disease Management Act (H.R.1550, S.689) provides funding to state and tribal agencies for management strategies to effectively mitigate the disease and combat its spread, and creates a rapid response fund. It also supports much needed research into the most effective methods to detect and respond to CWD and halt its spread. $60 million.
- Section 104 of America's Conservation Enhancement Act (S. 3051) stands up a CWD Task Force within the U.S. Fish and Wildlife Service, and establishes a framework and plan for coordinated interstate action. $5 million.
- Chronic Wasting Disease Transmission in Cervidae Study Act (H.R.837; S.382) authorizes a study to identify the predominant pathways and mechanisms of the transmission of CWD in wild, captive, and farmed populations of cervids in the United States. $2 million.

ESTABLISH A NATIONWIDE NETWORK OF WILDLIFE DISEASE COOPERATIVES

To augment existing federal programs there is a need to build out a nationwide network of regional wildlife disease cooperatives to better carry out surveillance, testing, and research and promote collaboration and coordination among federal and state agencies. Currently, regional wildlife disease cooperatives exist in the Southeast and Northeast supported by a patchwork of funding. We suggest building on this collaborative state-based model to establish a nationwide network of regional wildlife disease cooperatives, with the USGS National Wildlife Health Center serving as the central node for this nationwide network. The goals of such a network would include: detecting the causes of sickness and death in wildlife; determining the impact of diseases and parasites on wild animal populations; delineating disease interrelationships between wildlife and domestic livestock; and determining the role of wildlife in transmission of human diseases. To do so, we recommend the following:

- Enhance funding and capacity for existing regional wildlife disease cooperatives in the Southeast and Northeast.
- Establish at least 2 new regional wildlife disease cooperatives, in the Midwest and West, to achieve nationwide coverage.
- Create a national node for the network at the National Wildlife Health Center to coordinate this federal-state collaborative network.
- Provide $30M/year in funding to the network of wildlife disease cooperatives to cover costs in establishing and operating the regional and national nodes.

ENHANCE U.S. LEADERSHIP IN ADDRESSING WILDLIFE DISEASES INTERNATIONALLY

In addition to increasing domestic programs and funding, the United States must assert leadership in combating wildlife diseases internationally. We recommend the following:

- The U.S. Agency for International Development (USAID) must ensure that funds for the USAID Global Health programs include zoonotic disease surveillance. We recommend that USAID renew funding for the PREDICT program or a similar program focused on detecting and discovering viruses of pandemic potential that can move between animals and people, for at least another five year term.
- Institute a US government interagency Zoonotic Disease Task Force to ensure a whole of government approach to the development of protocols and actions to prevent future global pandemics, in collaboration with existing international working groups and other nations.
- Prioritize action to shut down live and other high-risk wildlife markets and reduce market hunting and demand for wildlife products procured illegally, unsustainably, or from captive animals, through US government high-level diplomacy with other nations;
- Scale up efforts to combat wildlife trafficking by ensuring full funding for US government programs that support efforts to eliminate illegal and unsustainable wildlife trade and consumption.
- Reauthorize and update the END Wildlife Trafficking Act to reflect the role that wildlife trafficking plays in the emergence of highly infectious diseases, including potential future pandemics, and take steps through legislation and Administrative action to prevent high-risk taxa and harmful zoonotic pathogens from entering the United States.
- Fully fund the U.S. Fish and Wildlife Service's (FWS) Division of Law Enforcement capacity to prevent illegal wildlife trade within and into the United States (wildlife inspectors and special agents), and increase the number of FWS attachés in US embassies across the globe to increase capacity to tackle illegal wildlife trade and identify high-risk wildlife markets.

The United States should also take actions to slow the rate of tropical forest destruction and the displacement of peoples into intact tropical ecosystems, which sets the stage for the spill-over of zoonotic diseases into human populations. To do so, we recommend the following:

- Amend legislative language, and/or add appropriations language, in the International Financial Institutions Act, as well as other legislation that relates to U.S. participation in multilateral development banks and similar financial institutions, to direct the Department of the Treasury to:
    - Use the voice and vote of the U.S. government in multilateral financial institutions to require an analysis of projects and policies for any potential direct or indirect displacement of farmers or other local communities that might promote their movement into intact tropical forest areas or otherwise lead to deforestation, and require that any such projects or policies be formulated to avoid such direct or indirect displacement impacts.
- Through appropriations language, or other relevant legislative vehicles, direct USAID to perform a study of the development projects and policies funded by USAID or the

multilateral development banks and similar financial institutions in the last 10 years, to determine if any such projects or policies might have had the effect of directly or indirectly displacing the activities of small farmers or members of vulnerable local communities into areas of tropical forest or leading to deforestation, and to make recommendations of how such displacement could have been avoided.

- Address the role that indiscriminate U.S. imports of commodities plays in driving global deforestation by enacting a bill that, among other things would prohibit the import of commodities sourced from illegally deforested land, oblige companies to carry out supply chain due diligence for high-risk commodities, and establish a public procurement preference for zero deforestation products.
- Support implementation of the Tropical Forest Conservation Act by appropriating at least $20 million for implementation of the Act, and by reauthorizing the Act in FY2021.

Senator BARRASSO. Senator Whitehouse.

Senator WHITEHOUSE. Mr. Chairman, I just wanted to put in a good word for the International Conservation Caucus while we are having this conversation. That group has been working very hard to make sure that on a bipartisan basis, Members of Congress, members of the Senate, have the opportunity to understand these issues very well. Their support for the International Conservation Caucus Foundation has helped move us forward in oceans areas and other areas. I just wanted to add that plaudit before we drop the hammer.

Senator BARRASSO. Thank you very much for your leadership on that, Senator Whitehouse.

Thank you all for being here and for your participation and your testimony and your time.

The hearing is adjourned.

[Whereupon, at 11:42 a.m., the hearing was adjourned.]