BEFORE THE SECRETARY OF INTERIOR AND
THE U.S. FISH AND WILDLIFE SERVICE

Petition to List American Mink (*Neovison vison*) in Trade as Injurious under the Lacey Act

WeAnimalsMedia

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Notice of Petition

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I. Summary of Requested Action

The Animal Welfare Institute and the undersigned organizations hereby petition the U.S. Fish and Wildlife Service ("USFWS") to exercise its authority under the Lacey Act, 18 U.S.C. § 42, and its implementing regulations, 50 C.F.R. §§ 16.1-16.33, to prohibit the importation, transportation, and acquisition of American mink (*Neovison vison*) ("mink") by listing mink in trade—including live and dead specimens and parts containing fur—as injurious. Such action is necessary to protect humans, wild mink, and other wildlife. We submit this petition pursuant to Section 553(e) of the Administrative Procedure Act, 5 U.S.C. § 553(e). AWI requests a prompt response to this petition and that the USFWS explain in writing the basis for the action the agency decides to take in response to the petition. *See* 5 U.S.C. § 555(e).

Mink in trade are injurious to humans and wildlife in two primary ways. First, captive mink raised for their fur, and mink parts containing fur, could transmit dangerous pathogens to humans or wildlife. Second, mink that have escaped from fur farms could harm wild mink or other wildlife through hybridization, competition, disease transmission, and predation, including species listed as threatened and endangered under the Endangered Species Act ("ESA"), 16 U.S.C. §§ 1531-1544. Consequently, the USFWS should exercise its authority to prohibit trade of live and dead mink, including parts containing fur. Specifically, we request that the USFWS amend Section 16.11(a) of its regulations implementing the Lacey Act, 50 C.F.R. § 16.11(a), as detailed below in Section VII.

II. Petitioners

The Animal Welfare Institute, founded in 1951 and headquartered in Washington, DC, is a nonprofit charitable institution whose mission is to alleviate animal suffering caused by people. The organization fulfills this mission through public education, research, collaboration, media relations, litigation, outreach to agencies, engaging its members and supporters, and advocacy for stronger laws both domestically and internationally. AWI seeks better treatment of animals everywhere—in the wild, in research, in agriculture, in commerce, and in our communities.

Founded in 1954, the Humane Society of the United States fights the big fights to end suffering for all animals. Together with millions of supporters, we take on puppy mills, factory farms, trophy hunts, animal testing and other cruel industries. With our affiliates, we rescue and care for tens of thousands of animals every year through our animal rescue team's work and other hands-on animal care services. We fight all forms of animal cruelty to achieve the vision behind our name: A humane society.

Humane Society Legislative Fund works to pass animal protection laws at the state and federal level, to educate the public about animal protection issues and support humane candidates for office. Formed in 2004, HSLF is incorporated under section 501(c)(4) of the Internal Revenue Code as a separate lobbying affiliate of the Humane Society of the United States.

Animal Defenders International is a non-profit organization, founded in 1990, with offices in Los Angeles, London, and Bogota, and our wildlife sanctuary in Free State, South Africa. Our mission is to raise awareness, advocate, and promote the interest of humanity in the cause of justice and the suppression of all forms of cruelty to animals; to alleviate suffering; and to conserve and protect animals and their environment. We work along a full spectrum—conducting investigations; gathering empirical evidence; research and publication; engaging the public and policymakers for greater animal protections; and assisting law enforcement with global rescues.

Born Free USA works to ensure that all wild animals, whether living in captivity or in the wild, are treated with compassion and respect and are able to live their lives according to their needs. We oppose the exploitation of wild animals in captivity and campaign to keep them where they belong—in the wild. Born Free USA's primate sanctuary is one of the largest in the United States and provides a permanent home to monkeys rehomed from laboratories or rescued from zoos and private ownership.

III. Factual Background

A. Summary of mink in trade

Millions of mink are raised in captivity and killed for their fur each year in industrial farms across North America, Europe, and Asia. According to the latest data from the U.S. Department of Agriculture ("USDA") National Agricultural Statistics Service ("NASS"), in 2017 there were 236 mink farms in 18 states in the United States, with about two-thirds of those farms in Wisconsin, Utah, Idaho, and Oregon.[1] These farms housed between four and five million mink[2] and produced 3.31 million pelts.[3] By comparison, in 2018 there were approximately 60 mink farms in Canada that produced 1.76 million pelts, 2,750 mink farms in Europe that produced 34.7 million pelts, and 8,000 mink farms in China that produced 20.7 million pelts.[4]

Between 2017 and 2020, the number of mink pelts produced in the United States declined from 3.31 million to 1.41 million, and the value of pelts produced fell from $120 million to $47

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[1] *Quick Stats*, NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., https://quickstats.nass.usda.gov/results/2752C8F8-B35D-3CBC-8246-A19A2B968F96.

[2] According to NASS data, mink farms housed 963,895 mink as of the end of December in 2017. *See Quick Stats*, NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., https://quickstats.nass.usda.gov/results/6D358C82-D667-31B2-ACB3-A79E4D032338. This number does not include the 3.31 million animals killed for their pelts that year, or the number of animals killed or who died but whose pelts were not used. Thus, we estimate that there were about four to five million farmed mink in the United States in 2017.

[3] AGRIC. STAT. BD., NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., MINK (2018), https://downloads.usda.library.cornell.edu/usda-esmis/files/2227mp65f/qn59q6450/df65vb34t/Mink-07-20-2018.pdf.

[4] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 3, Fig. 1.

million.[5] The number of female mink bred to produce kits dropped from about 731,000 to about 324,000.[6] It is unclear whether, or to what extent, the total number of mink farms declined during that time, because the USDA has not made that information publicly available.

According to the latest available data from the USFWS's Law Enforcement Management Information System ("LEMIS"), in 2015, the United States imported 12,500 live mink and millions of mink-derived products, including about 41,000 pieces of trim, more than 91,000 garments, and about three million mink skins and skin pieces.[7] It is unclear how many live mink or mink products have been imported into the United States in more recent years because the USFWS has not released that information to the public, despite a recent federal court decision. *See Humane Soc'y Int'l v. U.S. Fish and Wildlife Serv.*, No. 16-720, 2021 WL 1197726 (D.D.C. March 29, 2021). We request that the USFWS review and consider all LEMIS data in acting on this petition.

B. Summary of injuriousness

As discussed in more detail in Section V, mink in trade are injurious because they can transmit disease and, when they escape, they can cause harm to wildlife. The greatest immediate concern is the transmission of the "severe acute respiratory syndrome coronavirus 2" ("SARS-CoV-2") pathogen from captive or escaped mink to humans or other wildlife. Since its emergence in late 2019, SARS-CoV-2 has caused a pandemic of respiratory disease known as "coronavirus disease 2019" ("COVID-19").[8] According to the U.S. Centers for Disease Control and Prevention ("CDC"), to date there have been more than 46 million reported cases of COVID-19 in the United States, and the disease has killed over 750,000 people[9]—more than died from the 1918 flu.[10] With the emergence of the Delta variant, the seven-day average of daily cases, hospitalizations, and deaths in the United States in September reached their highest levels in more than six months.[11] Though the numbers have declined recently, daily rates remain alarmingly high. In addition, tens of millions of eligible Americans remain unvaccinated.[12]

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[5] AGRIC. STAT. BD., NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., MINK (2018), https://downloads.usda.library.cornell.edu/usda-esmis/files/2227mp65f/qn59q6450/df65vb34t/Mink-07-20-2018.pdf.

[6] *Id.*; AGRIC. STAT. BD., NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., MINK (2018), https://downloads.usda.library.cornell.edu/usda-esmis/files/2227mp65f/qn59q6450/df65vb34t/Mink-07-20-2018.pdf.

[7] Information compiled from LEMIS data provided to AWI and other advocacy organizations by USFWS in response to requests made pursuant to the Freedom of Information Act, 5 U.S.C. § 552.

[8] *Coronavirus disease 2019 (COVID-19)*, MAYO CLINIC (Oct. 26, 2021), https://www.mayoclinic.org/diseases-conditions/coronavirus/symptoms-causes/syc-20479963.

[9] *COVID-19*, CDC, https://www.cdc.gov/coronavirus/2019-ncov/index.html.

[10] Elizabeth Gamillo, *Covid-19 Surpasses 1918 Flu to Become Deadliest Pandemic in American History*, Smithsonian Magazine (Sept. 24, 2021), https://www.smithsonianmag.com/smart-news/the-covid-19-pandemic-is-considered-the-deadliest-in-american-history-as-death-toll-surpasses-1918-estimates-180978748/.

[11] *Coronavirus in the U.S.: Latest Map and Case Count*, N.Y. TIMES (Oct. 7, 2021), https://www.nytimes.com/interactive/2021/us/covid-cases.html.

[12] Bridget Balch, *The cost of being unvaccinated is rising—will people be willing to pay the price?*, ASSOCIATION OF AMERICAN MEDICAL COLLEGES (Oct. 26, 2021), https://www.aamc.org/news-insights/cost-being-unvaccinated-rising-will-people-be-willing-pay-price.

Further, some people who are fully vaccinated against COVID-19 will still get sick because "vaccines are not 100% effective."[13] Indeed, as of October 4, 2021, the CDC had received reports of 30,117 patients from 50 U.S. states and territories with COVID-19 vaccination breakthrough infections who had been hospitalized or died.[14] Consequently, the disease continues to pose a serious, ongoing threat to human health and safety with no clear end in sight.

The disease also poses a threat to other species. Numerous wild, captive, and domesticated species have proven susceptible to infection, including captive[15] and wild[16] mink, white-tailed deer,[17] raccoons,[18] skunks,[19] multiple species of mice,[20] bushy-tailed woodrats,[21] lions,[22] tigers,[23] snow leopards,[24] cougars,[25] gorillas,[26] Asian small-clawed otters,[27] hyenas,[28] raccoon dogs,[29]

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[13] *Possibility of COVID-19 Illness after Vaccination*, CDC, https://www.cdc.gov/coronavirus/2019-ncov/vaccines/effectiveness/why-measure-effectiveness/breakthrough-cases.html#:~:text=Most%20people%20who%20get%20COVID,%E2%80%9Cbreakthrough%20infection.%E2%80%9D (Nov. 5, 2021).

[14] *Vaccines & Immunizations: COVID-19 Breakthrough Case Investigations and Reporting*, CDC (Oct. 4, 2021), https://www.cdc.gov/vaccines/covid-19/health-departments/breakthrough-cases.html. It appears that the CDC has since stopped reporting numbers of breakthrough infections.

[15] Susan A. Shriner et al., *SARS-CoV-2 Exposure in Escaped Mink, Utah, USA*, 27 EMERGING INFECTIOUS DISEASES 988, 988 (2021).

[16] Thomas DeLiberto, *Coronavirus Disease 2019 Update (536): Animal, USA (Utah) Wild Mink, First Case*, PROMED (Dec. 13, 2020), https://promedmail.org/promed-post/?id=8015608.

[17] Jeffrey C. Chandler et al., *SARS-CoV-2 Exposure in Wild White-Tailed Deer (Odocoileus virginianus)*, BIORXIV, July 2021, at 1; Suresh V. Kuchipudi et al., *Multiple spillovers and onward transmission of SARS-Cov-2 in free-living captive White-tailed deer (*Odocoileus virginianus*)*, BIORXIV, Nov. 2021.

[18] Raquel Francisco et al., *Experimental Susceptibility of North American Raccoons (Procyon lotor) and Striped Skunks (Mephitis mephitis) to SARS-CoV-2*, BIORXIV, Mar. 2021, at 1.

[19] Angela M. Bosco-Lauth et al., *Survey of Peridomestic Mammal Susceptibility to SARS-CoV-2 Infection*, BIORXIV, Jan. 2021, at 2.

[20] *Id*.; Anna Fagre et al., *SARS-CoV-2 Infection, Neuropathogenesis and Transmission Among Deer Mice: Implications for Spillback to New World Rodents*, PLOS PATHOGENS, May 2021, at 1; Anna Michelitsch et al., *SARS-CoV-2 in animals: From potential hosts to animal models*, 110 Advances in Virus Rsch. 59 (2021).

[21] Angela M. Bosco-Lauth et al., *Survey of Peridomestic Mammal Susceptibility to SARS-CoV-2 Infection*, BIORXIV, Jan. 2021, at 2.

[22] Margaret J. Hosie et al., *Anthropogenic Infection of Cats During the 2020 COVID-19 Pandemic*, VIRUSES, Jan. 2021, at 6.

[23] *Id*.

[24] *OIE Members have been keeping the OIE updated on any investigations or outcomes of investigations in animals:*, OIE, https://www.oie.int/en/what-we-offer/emergency-and-resilience/covid-19/#ui-id-3 (Sept. 6, 2021).

[25] *Id.*

[26] *Id.*

[27] *Id.*

[28] Victor Manuel Ramos, *Two spotted hyenas at the Denver Zoo are the first known to have Covid-19*, N.Y. TIMES (NOV. 7, 2021), https://www.nytimes.com/2021/11/07/us/hyenas-covid-positive-denver-zoo.html.

[29] Conrad M. Freuling et al., *Susceptibility of Raccoon Dogs for Experimental SARS-CoV-2 Infection*, 26 EMERGING INFECTIOUS DISEASES 2982, 2984 (2020).

fruit bats,[30] rhesus[31] and crab-eating macaques,[32] western lowland gorillas,[33] African green monkeys,[34] domestic cats and dogs,[35] ferrets,[36] hamsters,[37] and rabbits.[38] Experimental models predict a long list of additional, potentially susceptible species, including thirteen-lined ground squirrels, ermines, red foxes, several other species of nonhuman primates, and several species of bats.[39]

Captive mink raised for their fur are among the most vulnerable nonhuman animals susceptible to catching and spreading the virus. This is due both to the confined, stressful conditions in which they are raised, which compromises their immune systems and facilitates viral transmission,[40] and to the human-like structure of their angiotensin-converting enzyme 2 ("ACE2") receptors, which allows the SARS-CoV-2 spike protein to effectively bind to and enter (i.e., infect) their cells.[41] Since the beginning of the pandemic, more than 20,000 captive mink on U.S. mink farms have died from the disease,[42] while in Europe millions more have either died from the disease or been killed to prevent its spread.[43]

These farmed mink are unique not only in their susceptibility to the virus, but also in their ability to transmit it. To date, captive mink are the only animals verified to have transmitted the virus

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[30] Khan Sharun et al., *SARS-CoV-2 in Animals: Potential for Unknown Reservoir Hosts and Public Health Implications*, 41 VETERINARY QUARTERLY 181, 182 (2021).
[31] Vincent J. Munster et al., *Respiratory Disease in Rhesus Macaques Inoculated With SARS-CoV-2*, 585 NATURE 268, 268 (2020).
[32] Shuaiyao Lu, *Comparison of SARS-CoV-2 Infections Among 3 Species of Non-Human Primates*, BIORXIV, July 2020, at 3; *see also* Baoning Liu et al., *Bioinformatic Evaluation of the Potential Animal Models for Studying SARS-Cov-2*, HELIYON, Dec. 2020, at 1.
[33] Ann Gibbons, *Captive gorillas test positive for coronavirus*, SCIENCE (Jan 12, 2021), https://www.science.org/news/2021/01/captive-gorillas-test-positive-coronavirus.
[34] Courtney Woolsey et al., *Establishment of an African Green Monkey Model for COVID-19 and Protection Against Re-Infection*, 22 NATURE IMMUNOLOGY 86, 86 (2021).
[35] Jianzhong Shi et al., *Susceptibility of Ferrets, Cats, Dogs, and Other Domesticated Animals to SARS-Coronavirus 2*, 368 SCIENCE 1016, 1019 (2020).
[36] *Id.*
[37] Luca D. Bertzbach et al., *SARS-CoV-2 Infection of Chinese Hamsters (Cricetulus griseus) Reproduces COVID-19 Pneumonia in a Well-Established Small Animal Model*, 68 TRANSBOUNDARY & EMERGING DISEASES 1075, 1075 (2020); Jasper Fuk-Woo Chan et al., *Simulation of the Clinical and Pathological Manifestations of Coronavirus Disease 2019 (COVID-19) in a Golden Syrian Hamster Model: Implications for Disease Pathogenesis and Transmissibility*, 71 CLINICAL INFECTIOUS DISEASES 2428, 2428 (2020).
[38] Anna Z. Mykytyn et al., *Susceptibility of Rabbits to SARS-CoV-2*, EMERGING MICROBES & INFECTIONS, Jan. 2021, at 1.
[39] Junwen Luan et al., *Spike Protein Recognition of Mammalian ACE2 Predicts the Host Range and an Optimized ACE2 for SARS-CoV-2 Infection*, 526 BIOCHEMICAL & BIOPHYSICAL RSCH. COMMC'N 165, 166 (2020).
[40] *See, e.g.*, Jonathan Anomaly, *What's Wrong with Factory Farming*?, 8 PUB. HEALTH ETHICS 246 (2015); Jeanette I. Webster Marketon, *Stress hormones and immune function*, 252 CELLULAR IMMUNOLOGY 16 (2008).
[41] *See, e.g.*, Yulong Wei et al., *Predicting mammalian species at risk of being infected by SARS-CoV-2 from an ACE2 perspective*, SCI. REPORTS, Jan. 2021.
[42] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 7; *Confirmed Cases of SARS-CoV-2 in Animals in the United States*, U.S. DEP'T OF AGRIC., ANIMAL PLANT HEALTH INSPECTION SERV. https://www.aphis.usda.gov/aphis/dashboards/tableau/sars-dashboard (last updated Nov. 2, 2021).
[43] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 2, 9.

directly to humans.[44] It is also possible that captive mink have or could spread the virus to other species of wildlife.[45] This is alarming both because of the harm that the virus could cause to those species and because of the threat posed to humans if any wildlife (or farmed mink) populations were to become new host reservoirs in which the virus could mutate into more transmissible or dangerous variants.

Further, it appears that the virus can survive on mink fur much longer than on most other surfaces.[46] This raises concern about the extent to which live or dead mink, or mink parts or products containing mink fur, could transmit the virus to humans or other wildlife.

Finally, escaped mink could cause ecological harm by hybridizing or competing with wild mink,[47] transmitting the SARS-CoV-2 virus or other harmful diseases to wild mink or other species, or preying on threatened or endangered species.[48]

C. Summary of need and precedent for action

There is a significant risk that importing, transporting, or acquiring captive mink or mink parts could facilitate the spread of the SARS-CoV-2 virus or cause ecological damage. Mink in trade are thus injurious to humans and wildlife. Accordingly, the USFWS should exercise its authority to prohibit the importation, transportation, and acquisition of live and dead mink specimens, including parts containing fur.

There is ample precedent for taking such action. For example, in 2016, the USFWS added 201 species of salamanders—including live and dead specimens, and their parts—to the list of injurious wildlife to prevent the spread of another dangerous pathogen, *Batrachochytrium salamandrivorans* ("Bsal"). *See* 81 Fed. Reg. 1534 (Jan. 13, 2016). In its final rule, the agency explained that, while it does not have the authority to list pathogens themselves as injurious, it can list species that are hosts to pathogens, including viruses. *Id.* at 1537. Further, the agency determined to list the salamanders even though Bsal only infects other salamander species, and not humans or other wildlife. *Id.* at 1549. The SARS-CoV-2 virus, by contrast, poses a threat not only to mink, but also to humans and many species of wildlife.

Also in 2016, the USFWS listed 11 freshwater fish and crayfish species as injurious due to the risk that they could cause ecological harm if they became established in the wild, including by spreading pathogens harmful to native species. *See* 81 Fed. Reg. 67,862 (Sept. 30, 2016). Similarly, in 1993, the USFWS listed all members of the Salmonidae family as injurious to

[44] *See COVID-19: Animals & COVID-19*, CDC (Aug. 5, 2021), https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html.
[45] James Gorman, *One Wild Mink Near Utah Fur Farms Tests Positive for Virus*, N.Y. TIMES (Dec. 15, 2020), https://www.nytimes.com/2020/12/15/science/covid-wild-mink-utah.html.
[46] Jenni Virtanen et al., *Survival of SARS-CoV-2 on Clothing Materials*, ADVANCES IN VIROLOGY, Apr. 2021.
[47] *See, e.g.*, A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1183 (2009).
[48] *See, e.g.*, PA. FISH & BOAT COMM'N, SPECIES ACTION PLAN: BOG TURTLE 5 (2011).

prevent the introduction of several different fish pathogens into the wild. *See* 58 Fed. Reg. 58,976 (Nov. 5, 1993).

Further, in 1982, the USFWS listed raccoon dogs as injurious due to the ecological damage they could cause—including by potentially spreading diseases such as rabies—if they escaped from fur farms or zoos into the wild. *See* 47 Fed. Reg. 56,360 (Dec. 16, 1982). The agency did so despite the potential economic impact to raccoon dog fur farms operating in the United States at the time. It emphasized the environmental damage and greater economic losses that could occur as a result of "detrimental impacts to native furbearers, prey species, game species, and habitat quality" if raccoon dogs were to escape and become established in the wild. *Id.*

In light of the pressing need and clear precedent for action, the USFWS should expedite its listing of mink in trade as injurious. Importantly, while doing so may not completely eliminate the threats posed by mink in trade, the USFWS should nonetheless take the requested action because it will reduce the risk of significant harm to humans and wildlife, help combat the current health crisis, and fulfill the agency's legal responsibilities.

IV. Legal Framework

The Lacey Act prohibits the importation of injurious wildlife species into the United States and its territories. 18 U.S.C. § 42(a); *see also* 50 C.F.R. §§ 16.11-16.15 (prohibiting the "importation, transportation, and acquisition" of injurious species). The Act also prohibits the shipment of such species between "the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any possession of the United States."[49] 18 U.S.C. § 42(a). The law allows limited exceptions for zoological, educational, medical, and scientific purposes. *Id.* at § 42(a)(3); *see also* 50 C.F.R. §§ 16.11-16.15, 16.22.

The Act authorizes the Secretary of the Interior to designate, through the adoption of regulations, any "species of wild mammals, wild birds, fish (including mollusks and crustacea), amphibians, [or] reptiles" as "injurious to human beings, to the interests of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States." 18 U.S.C. § 42(a)(1). Under the Act, "the term 'wild' relates to any creatures that, whether or not raised in captivity, normally are found in a wild state; and the terms 'wildlife' and 'wildlife resources' include those resources that comprise wild mammals, wild birds, fish (including mollusks and crustacea) and all other classes of wild creatures whatsoever, and all types of aquatic and land vegetation upon which such wildlife resources are dependent." *Id.* at § 42(a)(2). Any species determined to be injurious must be "promptly exported or destroyed at the expense of the importer or consignee." *Id.* at § 42(a)(1).

[49] In 2017, the United States Court of Appeals for the District of Columbia held that under this clause, known as the "shipment clause," the USFWS has the authority only to prohibit shipment between the listed jurisdictions, not between the continental United States. *See U.S. Assoc. of Reptile Keepers v. Zinke*, 852 F.3d 1131 (D.C. Cir. 2017).

Under the Act, the USFWS may list species "that are nonnative or indigenous to the United States." 81 Fed. Reg. 1534, 1538 (Jan. 13, 2016). The agency has listed numerous taxa of mammals, birds, fish, mollusks, crustaceans, amphibians, and reptiles. *See* 50 C.F.R. §§ 16.11-16.15.[50] The list includes seven taxa of mammals, including raccoon dogs (*Nyctereutes procyonoides*)—a species commonly raised for its fur.[51] *See* 50 C.F.R. § 16.11.[52]

Neither the Act nor USFWS regulations define "injurious." However, the USFWS has developed "Injurious Wildlife Evaluation Criteria" to assess whether a species qualifies as injurious under the Act.[53] These criteria include factors that may contribute to, or reduce the likelihood of, the species being considered injurious. Factors that contribute to injuriousness are:

- The likelihood of release or escape;
- Potential to survive, become established, and spread;
- Impacts on wildlife resources or ecosystems through hybridization and competition for food and habitats, habitat degradation and destruction, predation, and pathogen transfer;
- Impacts to threatened and endangered species and their habitats;
- Impacts to human beings, forestry, horticulture, and agriculture; and
- Wildlife or habitat damages that may occur from control measures.

81 Fed. Reg. at 1538.[54] Factors that reduce the likelihood of a species being considered as injurious are:

- Ability to prevent escape and establishment;
- Potential to eradicate or manage established populations (for example, making organisms sterile);
- Ability to rehabilitate disturbed ecosystems;
- Ability to prevent or control the spread of pathogens or parasites; and

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[50] *See Summary of Species Currently Listed as Injurious Wildlife Under (18 U.S.C. 42) (Lacey Act)*, U.S. FISH & WILDLIFE SERV. (Dec. 2020), https://www.fws.gov/injuriouswildlife/list-of-injurious-wildlife.html.

[51] Jane Dalton, *It's not just mink: Foxes and raccoon dogs on fur farms 'may infect humans with coronaviruses', scientists warn*, INDEPENDENT (Nov. 26, 2020), https://www.independent.co.uk/climate-change/news/mink-fur-farm-covid-foxes-raccoon-dogs-b1759223.html.

[52] Those taxa are: "(1) Any species of so-called "flying fox" or fruit bat of the genus Pteropus; (2) any species of mongoose or meerkat of the genera Atilax, Cynictis, Helogale, Herpestes, Ichneumia, Mungos, and Suricata; (3) any species of European rabbit of the genus Oryctolagus; (4) any species of Indian wild dog, red dog, or dhole of the genus Cuon; (5) any species of multimammate rat or mouse of the genus Mastomys; (6) any raccoon dog, Nyctereutes procyonoides; and (7) any brushtail possum, Trichosurus Vulpecula." 50 C.F.R. § 16.11. *See also Summary of Species Currently Listed as Injurious Wildlife Under (18 U.S.C. 42) (Lacey Act)*, U.S. FISH & WILDLIFE SERV. (Dec. 2020), https://www.fws.gov/injuriouswildlife/list-of-injurious-wildlife.html.

[53] *See* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf; *see also, e.g.*, Listing Salamanders as Injurious Wildlife Species Due to Risk of Salamander Chytrid Fungus, 81 Fed. Reg. 1534, 1536, 1538, 1547-1550 (Jan. 13, 2016) (enumerating and applying the criteria to numerous salamander species).

[54] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA 2 (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.

- Any potential ecological benefits to introduction.

Id.[55]

In recent years, the USFWS has applied these criteria in determining whether to list numerous species and taxonomic groups as injurious, including 201 species of salamanders (*see* 81 Fed. Reg. 1534), several species of freshwater fish and crayfish (*see* 81 Fed. Reg. 67,862), and several species of snakes (*see* 80 Fed. Reg. 12,702 (March 10, 2015); 77 Fed. Reg. 3330 (Jan. 23, 2012)).

V. Mink in Trade Are a Species of Wild Mammal Injurious to Humans and Wildlife

Mink in trade are a species of wild mammal that qualifies for listing as injurious under the Lacey Act. They are injurious because it is likely that some mink will escape from captivity, survive and spread in the wild, and negatively impact wild mink through hybridization, competition, and disease transmission. They could also adversely affect threatened and endangered species through predation. Even more concerning, captive mink—whether they have escaped or not—are capable of transmitting the SARS-CoV-2 virus to humans and other wildlife. Finally, lethal control measures used to try to eradicate escaped mink or mitigate the threats posed by captive mink would likely cause damage to wildlife because such measures are often inhumane, indiscriminate, and ineffective.

A. Mink in trade are a species of wild mammal

As discussed above, the Lacey Act authorizes the USFWS to list any "species of wild mammal[]" as injurious. 18 U.S.C. § 42(a)(1). Under the Act, a mammal species is wild if it is "any creature[] that, whether or not raised in captivity, normally [is] found in a wild state." *Id.* For instance, raccoon dogs, which are native to northern Indochina and were listed by the USFWS as injurious in 1982 (*see* 47 Fed. Reg. 56,360), are creatures that, while raised in captivity for their fur, are normally found in the wild and therefore are a species of wild mammal.

Like raccoon dogs, mink are normally found in a wild state. Mink are native to North America.[56] They occur "from Alaska and Canada through the United States except Arizona and the dry parts of California, Nevada, Utah, New Mexico, and western Texas."[57] They are normally "found along streams and lakes as well as in swamps and marshes" with a preference for densely vegetated areas.[58] Mink in the wild are carnivorous, typically preying on fish, amphibians, crustaceans, muskrats, voles, mice, and, in open prairie habitats, waterfowl.[59] They are primarily

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[55] *See also id*.
[56] Reid et al., *NEOVISON VISON*, AMERICAN MINK ASSESSMENT, IUCN 2-3 (2016).
[57] *Id.* at 1.
[58] *Id.* at 4.
[59] *Id.*; KERRY FORESMAN, MAMMALS OF MONTANA 332-333 (Montana Press Publishing Co., 2d ed. 2012).

nocturnal and remain active year-round.[60] Mink build dens in log or rock piles, usually near water.[61] They build nests of "leaves, grass, and the fur and feathers of prey."[62]

Temporally, spatially, and numerically, mink are "normally found in a wild state." Temporally, mink have existed in the wild for millions of years.[63] By contrast, mink farming did not begin in North America until the 1860s,[64] or in Europe until the 1920s.[65] Spatially, as discussed above, mink are widely distributed across millions of square kilometers throughout most of the continental United States and Canada. Within the same vast region, captive mink occur on just 236 farms in fewer than half of the U.S. states and on just 60 farms in Canada. Numerically, while there are no total population estimates for mink in North America, their population densities are estimated to be about 1-8 per square kilometer.[66] Applied across many millions of square kilometers of current range, that equates to a population of millions to tens of millions of individuals in the wild. By contrast, there are at most a few million animals raised in farms in North America during the spring, summer, and fall—and far fewer during the winter after the majority have been killed for their pelts. It is clear that, despite also being raised in captivity, mink are a creature normally found in the wild. Thus, mink in trade are a species of wild mammal.

B. Some captive mink are likely to escape

The first factor the USFWS considers to assess injuriousness is "the likelihood of release or escape." 81 Fed. Reg. at 1538.[67] Mink regularly escape from captivity. Over the last century, "the global spread of mink farming has brought with it an associated spread of feral American mink, because it is difficult to prevent the escape or intentional release of mink from captivity."[68] Indeed, mink "have likely been escaping into the wild since the advent of mink farming."[69]

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60 KERRY FORESMAN, MAMMALS OF MONTANA 333 (Montana Press Publishing Co., 2d ed. 2012).
61 *Id.* at 333.
62 *Id.*
63 Larisa E. Harding & Felisa A. Smith, *Mustela or Vison? Evidence for the Taxonomic Status of the American Mink and a Distinct Biogeographic Radiation ...*, 52 MOLECULAR PHYLOGENETICS & EVOLUTION 632, 638 (2009).
64 GUNNAR JOERGENSEN, MINK PRODUCTION 11 (Scientifur ed. 1985); Kimberley Y. Morris et al., *Functional Genetic Diversity of Domestic and Wild American Mink (Neovison vison)*, 13 EVOLUTIONARY APPLICATIONS 2610, 2611 (2020).
65 David W. MacDonald & Lauren A. Harrington, *The American Mink: The Triumph and Tragedy of Adaptation out of Context*, 30 N.Z. J. ZOOLOGY 421, 422 (2003).
66 Reid et al., *NEOVISON VISON*, AMERICAN MINK ASSESSMENT, IUCN 4 (2016).
67 *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA 2 (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.
68 Jeff Bowman et al., *Hybridization of Domestic Mink with Wild American Mink (Neovison vison) in Eastern Canada*, 95 CANADIAN J. ZOOLOGY 443 (2017).
69 Larissa A. Nituch et al., *Mink Farms Predict Aleutian Disease Exposure in Wild American Mink*, 6 PLOS ONE, July 2011, at 1.

In Europe, for example, escaped mink have been documented in numerous countries, including Austria, Belgium, Denmark, Slovenia, and Spain.[70] In Denmark, "[e]very year, a few thousand mink escape. We know that because they are an invasive species and every year hunters and trappers kill a few thousand wild mink. The population of escaped mink is quite stable."[71] In fact, studies have estimated that more than 20 percent—and in some areas more than 80 percent—of the free-ranging mink population on mainland Denmark are escaped farm mink.[72] Escaped mink have also been recorded in southern Chile and Argentina, where commercial mink farming was introduced in the 1930s and 1940s.[73]

Likewise, in Canada, researchers have reported "common and widespread escape of mink from ranches."[74] For example, in a survey of free-ranging mink in two locations near mink farms in southern Ontario, Kidd et al. (2009) determined that, on average, 64 percent were either escaped mink or escaped-wild mink hybrids.[75] Beauclerc et al. (2013) surveyed a similar area and reported a lower, though still significant, estimate of 18 percent of mink in the study area as escapees or domestic-wild hybrids.[76] Bowman et al. (2007) reviewed data from the largest fur auction house in Canada between 2002 and 2004 and found that at least 38 percent of free-ranging mink captured by trappers in Nova Scotia were of domestic origin.[77] More recently, mink made headlines when they escaped from farms in the Fraser Valley in southwestern British Columbia.[78]

Mink also escape from farms in the United States. For instance, the president of the Wisconsin Trappers Association recently acknowledged that he "has been catching the odd mink-ranch escapee for many years."[79] He said that in the 1970s, "[i]t was not uncommon to catch mink that

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[70] Laura Bonesi & Santiago Palazon, *The American Mink in Europe: Status, Impacts, and Control*, 134 BIOLOGICAL CONSERVATION 470, 471-74 (2007).
[71] Sophie Kevany, *Escaped infected Danish mink could spread Covid in wild*, GUARDIAN (Nov. 27, 2020), https://www.theguardian.com/environment/2020/nov/27/escaped-infected-danish-mink-could-spread-covid-in-wild.
[72] Sussie Pagh et al., *Methods for the Identification of Farm Escapees in Feral Mink (Neovison vison) Populations*, PLOS ONE, Nov. 2019, at 2; Mette Hammershøj et al., *Danish Free-Ranging Mink Populations Consist Mainly of Farm Animals: Evidence From Microsatellite and Stable Isotope Analyses* 13 J. FOR NATURE CONSERVATION 267, 271 (2005).
[73] Andrea Previtali et al., *Habitat Use and Diet of the American Mink (Mustela vison) in Argentinian Patagonia*, 246 J. ZOOLOGY 482, 482 (1998); Gonzalo Medina-Vogel et al., *Assessment of the Efficiency in Trapping North American Mink (Neovison vison) for Population Control in Patagonia*, REVISTA CHILENA DE HISTORIA NAT., Apr. 2015, at 1.
[74] Jeff Bowman et al., *Assessing the Potential for Impacts by Feral Mink on Wild Mink in Canada*, 139 BIOLOGICAL CONSERVATION 12, 16 (2007).
[75] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1183 (2009).
[76] Kaela B. Beauclerc et al., *Assessing the Cryptic Invasion of a Domestic Conspecific: American Mink in Their Native Range*, 3 ECOLOGY & EVOLUTION 2296, 2296 (2013).
[77] Jeff Bowman et al., *Assessing the Potential for Impacts by Feral Mink on Wild Mink in Canada*, 139 BIOLOGICAL CONSERVATION 12, 15 (2007).
[78] *B.C. public health order places moratorium on new mink farms due to COVID-19*, VANCOUVER SUN (July 26, 2021), https://vancouversun.com/news/local-news/b-c-public-health-order-places-moratorium-on-new-mink-farms-due-to-covid-19.
[79] Kate Golden, *Wisconsin's No. 1 mink farming industry now seen as a COVID-19 risk*, CHANNEL 3000 (Jan. 30, 2021), https://www.channel3000.com/wisconsins-no-1-mink-farming-industry-now-seen-as-a-covid-19-risk/.

had every phase of color there was. Jet black, pure white, some that looked like dairy cows."[80] As in British Columbia, captive mink in the United States recently garnered national attention after escaping from farms in Utah.[81] State and federal agencies were investigating the presence of COVID-19 in mammals captured on or near mink fur farms in Utah where outbreaks of SARS-CoV-2 had occurred.[82] Over the course of one week in August 2020, they captured 102 mammals. Of those, 11 were escaped mink.[83] Later, in December 2020 and January 2021, USDA officials in Oregon captured three mink that had escaped from a fur farm, despite the farm being under quarantine because of a SARS-CoV-2 outbreak.[84]

One of the reasons mink escape so often is the lack of regulatory oversight of the mink industry. For example, according to Nituch et al. (2011), "[t]here are currently either no, or inadequate, regulations concerning the escape of farmed mink in Canada. In most provincial jurisdictions, there are no minimum standards for biosecurity on fur farms. Perimeter fencing is [also] often inadequate."[85] The situation is similar in the United States. No federal and few state laws or regulations exist governing fur farms in general,[86] much less addressing the specific problem of escaping animals. The Fur Commission USA ("Fur Commission"), an association that represents U.S. mink farmers, has developed guidelines regarding perimeter fencing.[87] However, those are not mandatory, and it is unclear how many, if any, mink farmers adhere to these guidelines. The guidelines themselves acknowledge that perimeter fencing on fur farms has often been found to be "non-existing or faulty."[88]

Another factor contributing to escapes is the high numbers and densities of animals in fur farms, which increase the chances that some will be insufficiently monitored and will succeed in escaping. As the USFWS explained in its raccoon dog listing rule, "The probability of escape of some fur farm raccoon dogs to some extent is proportional to their abundance in captivity." 48 Fed. Reg. at 58,361. With several million mink in fur farms across the United States, the likelihood that at least some of them will escape each year is high.

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[80] *Id.*
[81] Danny Peterson, *3 mink caught outside quarantined farm; 2 test SARS-CoV-2 positive*, KOIN (Jan. 13, 2021), https://www.koin.com/news/health/coronavirus/3-mink-caught-outside-quarantined-farm-2-test-sars-cov-2-positive/.
[82] Susan A. Shriner et al., *SARS-CoV-2 Exposure in Escaped Mink, Utah, USA*, 27 EMERGING INFECTIOUS DISEASES 988, 988 (2021).
[83] *Id*.
[84] Danny Peterson, *3 mink caught outside quarantined farm; 2 test SARS-CoV-2 positive*, KOIN (Jan. 13, 2021), https://www.koin.com/news/health/coronavirus/3-mink-caught-outside-quarantined-farm-2-test-sars-cov-2-positive/.
[85] Larissa A. Nituch et al., *Mink Farms Predict Aleutian Disease Exposure in Wild American Mink*, PLOS ONE, July 2011, at 2.
[86] Born Free USA, SILENT SUFFERING IN OUR OWN BACKYARD: FUR FARMING IN THE UNITED STATES 10 (2020).
[87] John S. Easley D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 2 (2019).
[88] *Id.* at 3.

C. Escaped mink are likely to survive and spread

The second factor the USFWS considers to assess injuriousness is the "potential to survive, become established, and spread." 81 Fed. Reg. at 1538.[89] Escaped mink have proven quite capable of surviving and spreading in the wild. Released and escaped American mink have colonized many countries around the world, including Austria, Belarus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Norway, Poland, Slovakia, Spain, the United Kingdom, Russia, Chile, and Argentina.[90] They have also escaped, survived, and spread in portions of Canada.[91]

It does not appear that any studies have yet analyzed whether or to what extent farmed mink have escaped, survived, established feral populations, or interacted with native mink in the United States. As discussed above, it is clear that farmed mink in the United States occasionally escape. It is also clear that escapees can survive in the wild in areas of Canada such as the portions of southern Ontario studied by Kidd et al. (2009) and Beauclec et al. (2013). Those areas are near—and contain the same or similar types of ecosystems and environmental resources as[92]—states such as Michigan, Ohio, and Pennsylvania, each of which also have numerous mink fur farms.[93] Further, it is clear that wild-escaped mink hybrids can survive and spread. Kidd et al. (2009) documented hybrids 40 kilometers from the nearest mink fur farms.[94] Beauclerc et al. (2013) described mink as "vagile dispersers" and pointed out that their "semiaquatic nature likely facilitates extensive movement via interconnected water bodies."[95]

In an interview with *Sierra*, the president of the Wisconsin Trappers Association refuted the notion that farmed mink could not survive in the wild:

> "A lot of people have a mindset that if the ranch mink would escape, it wouldn't survive in the wild—they're used to getting their food twice a day; they wouldn't

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[89] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA 2 (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf

[90] Laura Bonesi et al., *Competition Between Eurasian Itter Lutra lutra and American Mink Mustela vison Probed by Niche Shift*, 106 OIKOS 19, 23 (2004); David W. MacDonald & Lauren A. Harrington, *The American Mink: The Triumph and Tragedy of Adaptation Out of Context*, 30 N.Z. J. ZOOLOGY 421, 421-22 (2003); A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1175-77 (2009).

[91] Jeff Bowman et al., *Hybridization of Domestic Mink with Wild American Mink (Neovison vison) in Eastern Canada*, 95 CANADIAN J. ZOOLOGY 443 (2017); A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1175-77 (2009).

[92] *Ecoregions of North America*, EPA, https://www.epa.gov/eco-research/ecoregions-north-america.

[93] According to NASS data, as of 2017, Michigan had 12 mink farms, Ohio had 6, and Pennsylvania had 12. *Quick Stats*, NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., https://quickstats.nass.usda.gov/results/8E3659A6-1A31-3BED-9A61-08525BF3F24F.

[94] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1178 (2009); Kaela B. Beauclerc et al., *Assessing the Cryptic Invasion of a Domestic Conspecific: American Mink in Their Native Range*, 3 ECOLOGY & EVOLUTION 2296, 2296 (2013).

[95] Kaela B. Beauclerc et al., *Assessing the Cryptic Invasion of a Domestic Conspecific: American Mink in Their Native Range*, 3 ECOLOGY & EVOLUTION 2296, 2306 (2013).

> know how to hunt," he said. "But it's interesting how things survive. They adapt. If you are hungry, you eat anything smaller than you. And when they find a wonderful food source like a fish hatchery, that's like heaven on earth for them, and they're staying put."[96]

In its raccoon dog injurious listing rule, the USFWS referenced, in part, an incident where a raccoon dog escaped from a fur farm in northern Minnesota and survived several weeks until it was struck by a car, to justify the agency's concern about the species' capacity to survive and expand in the wild. *See* 47 Fed. Reg. at 58,361. It is clear that escaped mink are similarly, if not more, capable of surviving and spreading in the wild.

D. Escaped mink could negatively impact wild mink through hybridization and competition for resources

The third factor the USFWS considers to assess injuriousness is "impacts on wildlife resources or ecosystems through hybridization and competition for food and habitats, habitat degradation and destruction, predation, and pathogen transfer." 81 Fed. Reg. at 1538.[97] This section discusses how escaped mink could adversely impact wild mink through hybridization and competition. The next section discusses how farmed mink—whether escaped or in captivity—could also negatively impact both wildlife and humans through pathogen transfer.

i. Hybridization with wild mink

As mentioned above, Canadian researchers have determined that escaped mink hybridize with wild mink. Kidd et al. (2009) found that 28 percent of mink sampled in areas surrounding mink farms in southern Ontario were hybrids.[98] Even in locations further away (up to 40 kilometers) from those farms, 1 of 20 mink sampled in one area and 5 of 30 mink sampled in another area were hybrids.[99] Beauclerc et al. (2013) surveyed a similar set of areas in southern Ontario and found that 5 percent of the mink sampled were hybrids.[100]

These results are concerning because hybridization poses a risk to the genetic integrity of wild mink. Mink in captivity are intentionally bred to promote certain size, color, and behavioral characteristics that are favorable for production.[101] As a result of such artificial selection, farmed

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[96] Kate Golden, *The Wild World of Mink and Coronavirus*, SIERRA (Jan. 7, 2021), https://www.sierraclub.org/sierra/wild-world-mink-and-coronavirus.
[97] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.
[98] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1181 (2009).
[99] *Id*.
[100] Kaela B. Beauclerc et al., *Assessing the Cryptic Invasion of a Domestic Conspecific: American Mink in Their Native Range*, 3 ECOLOGY & EVOLUTION 2296, 2301 (2013).
[101] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1176 (2009); *Overview of the Fur farming Industry*, FUR INST. OF CAN., https://fur.ca/fur-farming/a-look-at-the-fur-farming-industry/.

mink also exhibit traits such as reduced brain size, inbreeding, and behaviors (such as aggression) that are linked to certain pelage colors.[102] In addition, mink raised in a captive setting, in the absence of predation and other agents of natural selection, experience a "relaxation of selection that may cause deleterious genes and phenotypes to increase in frequency."[103] Such characteristics, if introduced into wild populations, could result in outbreeding depression; that is, they may reduce the fitness of the wild populations and interfere with their adaptive abilities.[104] As warned by Kidd et al. (2009), "Introgressive hybridization of wild populations with domesticated animals may contribute to genetic homogenization, disrupt population structure, and contribute to local extinctions by the disruption of local adaptations."[105] That is why, "when domesticated species have wild conspecifics, one of the most detrimental impacts is the infusion of domestic genes via interbreeding."[106]

A decade later, Morris et al. (2020), also studying mink in Ontario, confirmed the fears of Kidd et al. (2009)—that, in fact, escaped-wild mink hybridization was reducing the fitness of wild mink in areas surrounding mink farms.[107] They found evidence to suggest that escaped mink were affecting the "functional genetic diversity of wild mink" and that there were "clear distinctions between wild individuals near mink farms and those located in areas without mink farms."[108]

Escaped mink thus constitute a perfect genetic storm: they are fit enough to survive and spread in the wild; but artificial selection has reduced their fitness to the point that hybridization with wild mink poses a danger to native populations. This is an alarming, though not surprising, phenomenon. Bowman et al. (2017) described several similar examples of hybridization between domestic animals and their wild counterparts, and the consequent negative impacts on the wild populations:

> To provide just a few examples, backcrosses between wild and farmed Atlantic salmon (*Salmo salar*) have lower fitness than wild salmon (McGinnity et al. 1993). Cross-breeding between wildcats (*Felis sylvestris*) and domestic house cats is a major conservation problem in Europe (Oliviera et al. 2008). Finally, native

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[102] Jeff Bowman et al., *Assessing the Potential for Impacts by Feral Mink on Wild Mink in Canada*, 139 BIOLOGICAL CONSERVATION 12, 13 (2007).
[103] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1176 (2009).
[104] *Id.* at 1176-77 (2009); Fred W. Allendorf et al., *The Problems with Hybrids: Setting Conservation Guidelines*, 16 TRENDS IN ECOLOGY & EVOLUTION 613, 621 (2001).
[105] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1183 (2009).
[106] *Id.* at 1175.
[107] Kimberley Y. Morris et al., *Functional Genetic Diversity of Domestic and Wild American Mink (Neovison vison)*, 13 EVOLUTIONARY APPLICATIONS 2610, 2610 (2020).
[108] *Id.*

> polecats (*Mustela putorius*) declined to near extinction in Britain after domestic ferrets began to escape and hybridize with the polecats (Davison et al. 1999).[109]

Further, mink farms occur throughout the United States; thus, the negative consequences of hybridization are not isolated to a few specific locations or mink populations. Instead, they are a concern throughout wild mink's range. The warning from Kidd et al. (2009) about mink farms in Canada applies with equal relevance to the United States: "Although this study occurred over a small spatial scale, mink ranches occur across much of the native range of mink [in Canada], meaning that hybridization could be widespread."[110]

The likelihood that escaped mink are hybridizing with wild mink in the United States, combined with the apparent lack of studies focused on this potential problem, is concerning. And, as Morris et al. (2020) cautioned, if left unaddressed, the situation could become worse: "[W]e advise genetic monitoring of American mink, because as domestic release events continue to occur, the disruption of genetic structure of wild populations surrounding farms will continue to accumulate."[111]

In stark language, Kidd et al. (2009) warned, "The overwhelming presence of domestic animals and their hybridization with mink in natural populations is of great concern for the future sustainability of wild mink populations."[112] They concluded that "there is an urgent need for addressing this issue if we are to preserve the genetic integrity of our native mink populations."[113] The capacity of escaped mink to hybridize with their native counterparts clearly poses a threat to wild mink populations, as has been documented in multiple peer-reviewed studies. As such, captive mink are injurious to mink in the wild, and the USFWS should prohibit their importation, transportation, and acquisition.

ii. Competition for resources with wild mink

In addition to hybridization, farmed mink could adversely impact wild mink through competition. Beauclerc et al. (2013) theorized that "[e]scaped domestic mink could potentially compete for resources with wild mink."[114] There do not appear to be studies focused specifically on this issue in the United States or Canada. However, such an impact is possible, particularly because farmed mink are selectively bred to be much larger than wild mink,[115] and captive

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[109] Jeff Bowman et al., *Hybridization of Domestic Mink with Wild American Mink (Neovison vison) in Eastern Canada*, 95 CANADIAN J. ZOOLOGY 443 (2017).
[110] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1183 (2009).
[111] Kimberley Y. Morris et al., *Functional Genetic Diversity of Domestic and Wild American Mink (Neovison vison)*, 13 EVOLUTIONARY APPLICATIONS 2610, 2621 (2020).
[112] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1175 (2009).
[113] *Id.* at 1184.
[114] Kaela B. Beauclerc et al., *Assessing the Cryptic Invasion of a Domestic Conspecific: American Mink in Their Native Range*, 3 ECOLOGY & EVOLUTION 2296, 2306 (2013).
[115] *What is a Mink?*, FUR COMMISSION USA, https://furcommission.com/mink-biology/.

breeding can result in “behavioral syndromes,” such as aggression, that are genetically linked to certain pelt colors.[116] This may mean that larger, more aggressive escaped mink could harass, displace, and even kill their native counterparts. Even without these artificial traits, mink in the wild are naturally aggressive: researchers have observed them “savagely attack[ing]” conspecifics.[117]

In a similar context, MacDonald et al. (2003) proposed that competition for food and interspecific aggression were two of the primary mechanisms by which invasive American mink caused a decline in native European mink across Europe and Russia.[118] The researchers attributed these dynamics, in part, to American mink’s larger body mass.[119] Similarly, Maran et al. (1998) reported evidence of “spontaneous hostility” between American mink and European mink and suggested that “American mink of both sexes go out of their way to harass European mink.”[120] Like MacDonald et al. (2003), they pointed to the larger size of American mink as conferring a significant advantage over the more diminutive European species: “[T]he robust build and confident character of American mink may allow them to overwhelm European mink in direct contests over other resources, such as food or dens.”[121] Maran et al. (1998) also observed that such hostility was in line with behavioral dynamics observed within other carnivore guilds:

> There is increasing evidence of significant intraguild aggression amongst carnivores. Red foxes may deliberately kill pine martens, *Martes martes*, in Scandinavia (Storch et al. 1995), coyotes, *Canis latrans*, kill kit foxes, *Vulpes velox*, in California, and lions kill cheetah cubs in Tanzania (Caro, 1994). In this context Hersteinsson & Macdonald (1922) argued that harassment by red foxes determines the southern limit to the range of Arctic foxes, and they suggested that the larger, more robust, red fox behaved towards Arctic foxes, *Alopex lagopus*, rather as if they were inferior conspecifics.[122]

Likewise, the USFWS listed raccoon dogs as injurious, in part, because they were “known to be aggressive and can readily compete for survival . . . . Raccoon dogs in Russia and eastern Europe compete with foxes (*Vulpes* spp.), badgers (*Meles meles*), mink (*Mustela vison*), muskrats (*Ondatra zibethica*), and some birds for territory, breeding sites, or food.” 47 Fed. Reg. at

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[116] Jeff Bowman et al., *Assessing the Potential for Impacts by Feral Mink on Wild Mink in Canada*, 139 BIOLOGICAL CONSERVATION 12, 13 (2007).
[117] T. Maran et al., *The Continuing Decline of the European Mink Mustela lutreola: Evidence for the Intraguild Aggression Hypothesis, in* BEHAVIOR AND ECOLOGY OF RIPARIAN MAMMALS 318 (Nigel Dunstone & Martyn L. Gorman eds., Cambridge Univ. Press 1998).
[118] David W. MacDonald & Lauren A. Harrington, *The American Mink: The Triumph and Tragedy of Adaptation out of Context*, 30 N.Z. J. ZOOLOGY 421, 428 (2003).
[119] *Id.*
[120] T. Maran et al., *The Continuing Decline of the European Mink Mustela lutreola: Evidence for the Intraguild Aggression Hypothesis*, *in* BEHAVIOR AND ECOLOGY OF RIPARIAN MAMMALS 317 (Nigel Dunstone & Martyn L. Gorman eds., Cambridge Univ. Press 1998).
[121] *Id.* at 306.
[122] *Id.* at 318.

56,360. This body of evidence suggests that larger, more aggressive escaped mink would compete with their smaller, wild counterparts in the United States, to the wild mink's detriment. Accordingly, this factor weighs in favor of finding captive mink to be injurious.

E. Farmed mink could adversely impact both humans and wildlife through pathogen transfer by way of numerous vectors

As mentioned above, the third factor the USFWS considers to assess injuriousness includes "pathogen transfer." 81 Fed. Reg. at 1538.[123] The fifth factor[124] is "impacts to human beings, forestry, horticulture, and agriculture." *Id.* This section analyzes the third and fifth factors together and discusses the negative impacts that farmed mink could have on both humans and wildlife through pathogen transfer.

The greatest immediate threat farmed mink pose to humans and wildlife is the potential to transmit dangerous pathogens. The Fur Commission's operating guidelines warn that disease transmission is a risk inherent to mink farming:

> Due to industry characteristics, mink farms have been expanding in size and in many cases there are multiple farms in close proximity to each other. This high density of animals increases the chance of disease transmission. Small farms are at just as much risk for disease as large farms; biosecurity concerns are everyone's concerns.[125]

Farmed mink are vulnerable to a plethora of diseases.[126] One study reviewing the cause of death of 339 farmed mink in Utah determined that nearly 95 percent (321) died from one or a combination of 11 different diseases.[127] One of the most serious diseases that affect mink is Aleutian disease.[128] Aleutian disease can cause spontaneous abortion and death in mink, and poses health risks for many other species, including humans.[129] Evidence of the disease (antibodies and virus DNA) has been found in wild populations of American mink, European mink, striped skunks, short-tailed weasels, river otters, raccoons, bobcats, badgers, polecats, stone martens, pine martens, and common genets in Europe and North America.[130] Wild animals can become infected through sharing habitat with, preying upon, or scavenging the carcasses of

[123] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.
[124] The fourth factor, "[i]Impacts to threatened and endangered species and their habitats," is discussed below in Section V.F.
[125] JOHN S. EASLEY D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 1 (2019).
[126] David J. Wilson et al., *Causes of mortality in farmed mink in the Intermountain West, North America* 27 J. VETERINARY DIAGNOSTIC INVESTIGATION 470, 472, Table 1 (2015).
[127] *Id.* at 470-475.
[128] Magdalena Zaleska-Wawro et al. (2021) *Seroprevalence and Molecular Epidemiology of Aleutian Disease in Various Countries during 1972-2021: A Review and Meta-Analysis*, ANIMALS , OCT. 2021, at 11.
[129] *Id.*
[130] *Id.* at 3-4, Table 1.

infected escaped mink or other infected wildlife.[131] Nituch et al. (2011) found that Aleutian disease was "present and widespread among free-ranging mink in Ontario."[132] They found evidence that the disease was being spread both by farmed mink escaping into the wild and by wild mink accessing mink farms, where the disease could be transmitted "through direct contact between wild and farmed animals, contact by wild individuals with contaminated carcasses and waste, or through aerosol dispersal."[133]

The most recent, and perhaps most worrying, biosecurity concern is transmission of the SARS-CoV-2 virus. As discussed in more detail below, mink farms could cause or result in transmission of the virus to humans or wildlife through a number of different vectors, including live mink (both caged and escaped), other animals, feces, wastewater and surface water runoff, carcasses, and fur.

i. Live mink

Both caged and escaped mink could contribute to the spread of SARS-CoV-2. It is clear that farmed mink can become infected with SARS-CoV-2 and that the virus can spread rapidly among them. There have been outbreaks of SARS-CoV-2 on more than 400 mink farms in North America and Europe,[134] including at least 17 in the United States.[135] As mentioned above, more than 20,000 farmed mink have died from the disease in the United States alone;[136] millions more have died from the disease or been culled in Europe in an attempt to prevent the spread of the disease.[137] Of the 11 escaped mink that were captured by state and federal officials near mink farms in Utah, discussed above, all 11 tested positive for SARS-CoV-2 antibodies, suggesting recent infection.[138] Of the three escaped mink captured near mink farms in Oregon, also mentioned above, two tested positive for SARS-CoV-2.[139] Indeed, in one of its guidance documents, the CDC warns that mink producers should use "extreme caution" when introducing new mink to a herd because "[n]ew animals may introduce disease problems into a mink farm,

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[131] A. Hossain Farid, *Aleutian mink disease virus in furbearing mammals in Nova Scotia, Canada* ACTA Veterinaria Scandinavica, 55:10, Feb. 2013.
[132] Larissa A. Nituch et al., *Mink Farms Predict Aleutian Disease Exposure in Wild American Mink*, PLoS ONE, 6(7):e21693, July 2011, at 4.
[133] *Id.*
[134] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 5-6; OIE, SARS-COV-2 IN ANIMALS – SITUATION REPORT 1-2 (2021).
[135] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 6; OIE, SARS-COV-2 IN ANIMALS – SITUATION REPORT 1-2 (2021).
[136] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 7; *Confirmed Cases of SARS-CoV-2 in Animals in the United States*, U.S. DEP' AGRIC. ANIMAL & PLANT HEALTH INSPECTION SERV., https://www.aphis.usda.gov/aphis/dashboards/tableau/sars-dashboard (Sept. 13).
[137] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 2, 6.
[138] Susan A. Shriner et al., *SARS-CoV-2 Exposure in Escaped Mink, Utah, USA*, 27 EMERGING INFECTIOUS DISEASES 988, 988 (Mar. 2021).
[139] Danny Peterson, *3 mink caught outside quarantined farm; 2 test SARS-CoV-2 positive*, KOIN (Jan. 13, 2021), https://www.koin.com/news/health/coronavirus/3-mink-caught-outside-quarantined-farm-2-test-sars-cov-2-positive/.

including SARS-CoV-2."[140] Likewise, Fur Commission operating guidelines acknowledge that a "main source of farm contamination is purchased animals."[141] The CDC even cautions that "[c]ar and truck tires, caging, and equipment can harbor viruses and other germs," and that mink farm workers traveling to other mink farms should therefore "clean and disinfect these items before returning to their own farms."[142]

It is also clear that infected farmed mink can transmit the virus to humans. Mink-to-human spread of SARS-CoV-2 has been reported in the Netherlands,[143] Denmark,[144] and Poland.[145] It has also likely occurred in the United States. According to the CDC, "Investigations found that mink from a Michigan farm and a small number of people were infected with SARS-CoV-2 that contained unique mink-related mutations (changes in the virus's genetic material). This suggests mink-to-human spread might have occurred."[146]

In addition, because of the proximity of many mink farms to wild mink habitat, it is likely that escaped mink could transmit the virus to wild mink. As identified above, in both Utah and Oregon, mink captured in the wild have tested positive for SARS-CoV-2. In Utah, one of the trapped infected mink is believed to have been a wild mink that caught the virus.[147] Scientists concluded through genome sequencing that the wild Utah mink likely became infected from an outbreak at a nearby commercial mink farm.[148]

While information about the specific locations of fur farms is generally unavailable to the public, the states in which mink farms are located all fall within the range of native mink.[149] Mink farms are often located in rural areas,[150] increasing the likelihood that escaped mink could come into

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[140] CDC, RESPONSE & CONTAINMENT GUIDELINES: INTERIM GUIDANCE FOR ANIMAL HEALTH AND PUBLIC HEALTH OFFICIALS MANAGING FARMED MINK AND OTHER FARMED MUSTELIDS WITH SARS-COV-2 4 (2020), https://www.aphis.usda.gov/publications/animal_health/sars-cov-2-mink-guidance.pdf.
[141] FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 4 (2019).
[142] CDC, RESPONSE & CONTAINMENT GUIDELINES: INTERIM GUIDANCE FOR ANIMAL HEALTH AND PUBLIC HEALTH OFFICIALS MANAGING FARMED MINK AND OTHER FARMED MUSTELIDS WITH SARS-COV-2 4 (2020), https://www.aphis.usda.gov/publications/animal_health/sars-cov-2-mink-guidance.pdf.
[143] Bas B. Oude Munnink et al., *Jumping Back and Forth: Anthropozoonotic and Zoonotic Transmission of SARS-CoV-2 on Mink Farms*, BIORXIV, Sept. 2020, at 21.
[144] Anne Sofie Hammer et al., *SARS-CoV-2 Transmission Between Mink (Neovison vison) and Humans, Denmark*, 27 EMERGING INFECTIOUS DISEASES 547, 550 (2021).
[145] Lukasz Rabalski et al., *Zoonotic Spillover of SARS-CoV-2: Mink-Adapted Virus in Humans*, BIORXIV, Mar. 2021, at 7.
[146] *COVID-19: Animals & COVID-19*, CDC (Aug. 5, 2021), https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html.
[147] Wufei Yu, *Why Utah's Wild Mink COVID-19 Case Matters*, HIGH COUNTRY NEWS (Jan. 20, 2021), https://www.hcn.org/issues/53.3/south-wildlife-why-utahs-wild-mink-covid-19-case-matters.
[148] James Gorman, *One Wild Mink Near Utah Fur Farms Tests Positive for Virus*, N.Y. TIMES (Dec. 15, 2020), https://www.nytimes.com/2020/12/15/science/covid-wild-mink-utah.html.
[149] Lauren A. Harrington et al., *Wild American Mink (Neovison vison) May Pose a COVID-19 Threat*, 19 FRONTIERS IN ECOLOGY & THE ENV'T 266, 266 (2021).
[150] *See e.g.*, Kate Golden, *Wisconsin's No. 1 mink farming industry now seen as a COVID-19 risk*, WIS. WATCH (Jan. 30, 2021), https://wisconsinwatch.org/2021/01/wisconsins-no-1-mink-farming-industry-now-seen-as-a-covid-

contact with wild mink. They are also often located near "good mink habitat."[151] In Utah, for example, "mink farms often overlap with designated critical mink habitats."[152] This means that escaped mink in those areas may not have to travel far to encounter wild mink.

Further, farmed mink can escape, survive, and spread. When they do, they can interact with wild mink in a variety of ways that would facilitate the spread of the virus:

> [L]ike other mustelids [mink] deposit feces at prominent marking spots that are investigated by neighbors (Hutchings and White 2000); such behaviors could facilitate viral transmission. In addition, during the mating season males will visit multiple females (Macdonald *et al*. 2015), and there is widespread and sometimes extensive movement of both males and females during the autumn when the young-of-the-year disperse from their natal territory (e.g. Oliver *et al*. 2016); both of these behaviors would also potentially facilitate viral spread if movements involve infected individuals.[153]

Indeed, as discussed above, escaped mink readily mate with wild mink, creating high-risk conditions for disease transmission. In light of these factors, it is not surprising that in December, the USDA confirmed the first case of SARS-CoV-2 in a free-ranging, wild mink near a mink farm in Utah.[154] This is troubling because of the impact that the virus could have on native mink populations. As Kidd et al. (2009) observed, one of the "avenues by which population declines of wild mink may be induced by the mink escaping from mink farms" is through the introduction of highly infectious, fatal diseases.[155] It is also concerning because wild mink could in turn spread the virus (potentially in a mutated and more transmissible or dangerous form) to humans: wild mink are commonly caught, killed, and handled by recreational trappers. For instance, in Wisconsin alone in 2019, where there are more than 50 mink farms, 1,100 trappers captured

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19-risk/; Lauren A. Harrington et al., *Wild American Mink (Neovison vison) May Pose a COVID-19 Threat*, 19 FRONTIERS IN ECOLOGY & THE ENV'T 266, 266 (2021).

[151] Jeff Bowman et al., *Assessing the Potential for Impacts by Feral Mink on Wild Mink in Canada*, 139 BIOLOGICAL CONSERVATION 12, 16 (2007).

[152] Susan A. Shriner et al., *SARS-CoV-2 Exposure in Escaped Mink, Utah, USA*, 27 EMERGING INFECTIOUS DISEASES 988, 989 (2021).

[153] Lauren A. Harrington et al., *Wild American Mink (Neovison vison) May Pose a COVID-19 Threat*, 19 FRONTIERS IN ECOLOGY & THE ENV'T 266, 266 (2021) (italics in original).

[154] Thomas DeLiberto, *Coronavirus Disease 2019 Update (536): Animal, USA (Utah) Wild Mink, First Case*, PROMED (Dec. 13, 2020), https://promedmail.org/promed-post/?id=8015608.

[155] A.G. Kidd et al., *Hybridization Between Escaped Domestic and Wild American Mink (Neovison vison)*, 18 MOLECULAR ECOLOGY 1175, 1184 (2009).

4,634 mink.[156] Hundreds more mink were trapped in recent years in Utah,[157] Idaho,[158] and Oregon,[159] where there are 55, 23, and 17 mink farms, respectively.[160]

ii. Other animals

Farmed mink may also transmit the virus to other wild animals, which may in turn spread the disease further. As the Fur Commission operating guidelines warn, "Many disease outbreaks [on mink farms] have been shown to have been transmitted by wildlife (raccoons, skunks, rodents, birds, feral cats, etc.)" that have accessed mink farms.[161] If these species are capable of accessing mink farms and transmitting diseases to mink, they may also be capable of accessing mink farms and becoming infected by diseased mink. Once infected, they could in turn transmit the virus to conspecifics or other species. Similarly, natural predators of mink, such as foxes, coyotes, wolves, bobcats, lynx, hawks, eagles, and great horned owls,[162] could prey on an escaped, infected mink and subsequently transport or transmit the virus.

In addition, some species not known to be susceptible to infection may nonetheless serve as mechanical vectors. For example, Boklund et al. (2021) detected low levels of SARS-CoV-2 on the foot of a seagull that had foraged beneath the cages of a mink farm in Denmark.[163] This raised the possibility that the seagull could transport the virus to another location and potentially transmit the virus to other animals. Species of native wildlife in the United States that are or may be susceptible to SARS-CoV-2 infection include mink and other mustelids,[164] white-tailed

[156] BRIAN DHUEY & SHAWN ROSSLER, FUR TRAPPER SURVEY 4-5 (2019-2020).
[157] UTAH DNR, UTAH FURBEARER ANNUAL REPORT 2020-2021 5, https://wildlife.utah.gov/pdf/annual_reports/furbearer/harvest_20-21.pdf
[158] IDAHO DEP'T FISH & GAME, SURVEYS AND INVENTORIES FY2019 STATEWIDE REPORT: FURBEARER 9 (2020), https://collaboration.idfg.idaho.gov/WildlifeTechnicalReports/Furbearer%20Statewide%20FY2019.pdf.
[159] ODFW, OREGON FURTAKER LICENSE AND HARVEST DATA 16 (2018), https://www.dfw.state.or.us/resources/hunting/small_game/docs/Furtaker_License_and_Harvest_Data.pdf.
[160] *Quick Stats*, NAT'L AGRIC. STAT. SERV., U.S. DEP'T OF AGRIC., https://quickstats.nass.usda.gov/results/4E128EAC-D669-34E9-8BC2-13426874CB34.
[161] JOHN S. EASLEY D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 3 (2019).
[162] *See, e.g.*, *American Mink*, ALASKA DEPT. OF FISH & GAME, http://www.adfg.alaska.gov/index.cfm?adfg=americanmink.printerfriendly; *Mink Biology: What is a Mink?*, FUR COMM'N USA, https://furcommission.com/mink-biology/.
[163] Anette Boklund et al., *SARS-CoV-2 in Danish Mink Farms: Course of the Epidemic and a Descriptive Analysis of the Outbreaks in 2020*, 11 ANIMALS 164 (2021).
[164] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021; Khan Sharun et al., *SARS-CoV-2 in Animals: Potential for Unknown Reservoir Hosts and Public Health Implications*, 41 VETERINARY QUARTERLY 181 (2021).

deer,[165] mountain lions,[166] raccoons,[167] rabbits,[168] red foxes,[169] skunks,[170] bats,[171] bushy-tailed woodrats,[172] thirteen-lined ground squirrels,[173] ermines,[174] and deer mice.[175]

The susceptibility of deer mice is particularly concerning. They are "abundant in regions where American mink (*Neovison vison*) are farmed, raising the possibility of contact with infected American mink or fomites (e.g., mink food) that may be contaminated with SARS-CoV-2."[176] This is worrisome because researchers have demonstrated that deer mice are not only susceptible to experimental infection of SARS-CoV-2, but can spread the virus to other deer mice.[177] They may also be able to spread it to any of the dozens of other members of the *Peromyscus* genus.[178] Further, they may be able to transmit it to people: "Deer mice (*P. maniculatus*) are the most studied and abundant mammals in North America and are frequently contacted by mammalogists during field studies."[179]

While experimentally infected deer mice appear asymptomatic or experience only mild disease, "[t]he extent to which these observations may translate to wild deer mouse populations remains

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[165] Jeffrey C. Chandler et al., *SARS-CoV-2 Exposure in Wild White-Tailed Deer (Odocoileus virginianus),* BIORXIV, July 2021, at 1.

[166] *OIE Members have been keeping the OIE updated on any investigations or outcomes of investigations in animals:*, OIE, https://www.oie.int/en/what-we-offer/emergency-and-resilience/covid-19/#ui-id-3 (last updated Oct. 12, 2021).

[167] Raquel Francisco et al., *Experimental Susceptibility of North American Raccoons (Procyon lotor) and Striped Skunks (Mephitis mephitis) to SARS-CoV-2*, BIORXIV, Mar. 2021, at 1.

[168] Anna Z. Mykytyn et al., *Susceptibility of Rabbits to SARS-CoV-2*, EMERGING MICROBES & INFECTIONS, Jan. 2021, at 1.

[169] Junwen Luan et al., *Spike Protein Recognition of Mammalian ACE2 Predicts the Host Range and an Optimized ACE2 for SARS-CoV-2 Infection*, 526 BIOCHEMICAL & BIOPHYSICAL RSCH. COMMC'N 165, 166 (2020).

[170] Angela M. Bosco-Lauth et al., *Survey of Peridomestic Mammal Susceptibility to SARS-CoV-2 Infection*, BIORXIV, Jan. 2021, at 2.

[171] Markus Hoffman et al., *SARS-CoV-2 Mutations Acquired in Mink Reduce Antibody-Mediated Neutralization*, CELL REPORTS, Apr. 2021, at 5.

[172] Angela M. Bosco-Lauth et al., *Survey of Peridomestic Mammal Susceptibility to SARS-CoV-2 Infection*, BIORXIV, Jan. 2021, at 2.

[173] Junwen Luan et al., *Spike Protein Recognition of Mammalian ACE2 Predicts the Host Range and an Optimized ACE2 for SARS-CoV-2 Infection*, 526 BIOCHEMICAL & BIOPHYSICAL RSCH. COMMC'N 165, 166 (2020).

[174] *Id.*

[175] Angela M. Bosco-Lauth et al., *Survey of Peridomestic Mammal Susceptibility to SARS-CoV-2 Infection*, BIORXIV, Jan. 2021, at 2.; Anna Fagre et al., *SARS-CoV-2 Infection, Neuropathogenesis and Transmission Among Deer Mice: Implications for Spillback to New World Rodents*, PLOS PATHOGENS, May 2021, at 1; Anna Michelitsch et al., *SARS-CoV-2 in animals: From potential hosts to animal models*, 110 ADVANCES IN VIRUS RSCH. 59 (2021).

[176] Anna Fagre et al., *SARS-CoV-2 Infection, Neuropathogenesis and Transmission Among Deer Mice: Implications for Spillback to New World Rodents,* PLOS PATHOGENS, May 2021, at 2.

[177] *Id.*

[178] Bryan D. Griffin et al., *SARS-CoV-2 Infection and Transmission in the North American Deer Mouse*, NATURE COMMC'NS, June 2021, at 1; Jasper Fuk-Woo Chan et al., *Simulation of the Clinical and Pathological Manifestations of Coronavirus Disease 2019 (COVID-19) in a Golden Syrian Hamster Model: Implications for Disease Pathogenesis and Transmissibility*, 71 CLINICAL INFECTIOUS DISEASES 2428, 2428 (2020); Sin Fun Sia et al., *Pathogenesis and Transmission of SARS-CoV-2 in Golden Hamsters*, 583 NATURE 834, 834 (2020).

[179] Anna Fagre et al., *SARS-CoV-2 Infection, Neuropathogenesis and Transmission Among Deer Mice: Implications for Spillback to New World Rodents,* PLOS PATHOGENS, May 2021, at 2, 7.

unclear."[180] That is, deer mice in the wild could experience more or less severe forms of the disease.[181] If it is more severe, it could have a greater impact on deer mouse populations; if it is relatively mild, it could make infected populations more difficult to detect and monitor. In either case, Griffin et al. (2021) warned that there is a real risk that deer mice or other *Peromyscus* mice could become reservoirs of SARS-CoV-2, as they have for several other diseases: "The findings reported here are concerning in light of the fact that *Peromyscus* species rodents tolerate persistent infection with and serve as the primary reservoirs for several emerging zoonotic pathogens that spillover into humans, including *Borrelia burgdorferi* [the causative agent of Lyme disease], DTV [deer tick virus], and SNV [Sin Nombre orthohantavirus]."[182]

There is also a serious risk of reservoir establishment in carnivore species such as mink. This is because carnivorous mammals are "immunologically challenged,"[183] in that they "have either missing or mutated immune genes that make them less able to identify and fend off pathogens."[184] This lack of functioning genes can enable pathogens to hide and spread undetected (i.e., the host animals appear asymptomatic), which in turn increases the risk of carnivores becoming new reservoirs for disease. Indeed, researchers have found that approximately 49 percent of carnivore species—"the highest proportion of any mammal order including bats,"—harbor one or more unique zoonotic pathogens.[185]

The risk of reservoir establishment is especially high in environments such as industrial mink farms, where the crowded conditions facilitate viral transmission.[186] Indeed, while thousands of farmed mink have become visibly sick and died from the virus, many others appear to have experienced asymptomatic infections. For example, after testing farmed mink in Denmark, Hammer et al. (2021) reported that many infections "occurred with little clinical disease or increase in death, making it difficult to detect the spread of infection; thus, mink farms could represent a serious, unrecognized animal reservoir for SARS-CoV-2."[187]

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[180] Bryan D. Griffin et al., *SARS-CoV-2 Infection and Transmission in the North American Deer Mouse*, NATURE COMMC'NS, June 2021, at 1.
[181] Analogously, the USFWS determined that salamander species could experience more severe disease in the wild than under experimental conditions. *See* 81 Fed. Reg. 1534, 1535 (Jan. 13, 2016) ("Native salamander species that demonstrate limited disease under experimental conditions may demonstrate more severe clinical disease when infection is combined with additional stressors in the wild.").
[182] Bryan D. Griffin et al., *SARS-CoV-2 Infection and Transmission in the North American Deer Mouse*, NATURE COMMC'NS, June 2021, at 6.
[183] Zsofia Digby, *Evolutionary loss of inflammasomes in the Carnivora and implications for the carriage of zoonotic infections*, CELL REPORTS, Aug. 2021, at 3.
[184] Annie Lennon, *Farming carnivores may encourage 'disease reservoirs'*, MED. NEWS TODAY (Aug. 27, 2021), https://www.medicalnewstoday.com/articles/farming-carnivores-may-encourage-disease-reservoirs.
[185] Zsofia Digby, *Evolutionary loss of inflammasomes in the Carnivora and implications for the carriage of zoonotic infections*, CELL REPORTS, Aug. 2021, at 1; Barbara Han et al., *Global patterns of zoonotic disease in mammals*, 32 TRENDS IN PARASITOLOGY 7, July 2016, at 571.
[186] Jonathan Anomaly, *What's Wrong with Factory Farming*?, 8 PUB. HEALTH ETHICS 246 (2015); Jeanette I. Webster Marketon, *Stress hormones and immune function*, 252 CELLULAR IMMUNOLOGY 16 (2008).
[187] Anne Sofie Hammer et al., *SARS-CoV-2 Transmission between Mink (*Neovison vison*) and Humans, Denmark*, 27 EMERGING INFECTIOUS DISEASES 547 (2021); *see also* M. Pomorska-Mól et al., *Review: SARS-CoV-2 Infection in Farmed Minks – an Overview of Current Knowledge on Occurrence, Disease and Epidemiology*, ANIMAL, June 2021, at 1.

The potential for mink or other species to become permanent reservoirs for the virus is a major concern for several reasons. First, it could cause ongoing illness and death within the infected animal population itself. Second, the virus could evolve and mutate into variants that are more transmissible or dangerous to humans. For example, Munnink et al. (2020) estimated that the virus mutates approximately once every two weeks in farmed mink populations.[188] These mutations can result in variants that are more harmful and less susceptible to vaccines than the original strain. As Banerjee et al. (2021) warn, "The presence of additional SARS-CoV-2 variants with the ability to reinfect vaccinated or immune populations has the potential for devastating consequences for human health."[189]

Most concerning may be mutations that occur within the virus' spike proteins—the protrusions on the surface of the virus particle that help the virus attach to and enter host cells. Changes in the spike protein are particularly important because such mutations could create "virus populations that would no longer be susceptible to neutralization by antibodies present in vaccinated or naturally infected individuals."[190] Fenollar et al. (2021) reported that, as of early 2021, about 170 mutations had been identified in mink SARS-CoV-2 samples from 40 mink farms, "and mink-specific mutations of SARS-CoV-2 (including a . . . mutation in the viral spike) have been found in humans."[191]

Third, if it infects animals that already host other coronaviruses, such as many bat species, the SARS-CoV-2 virus could "recombine" with those coronaviruses. That is, the viruses could "interact during replication to generate virus progeny that have some genes from both parents."[192] The process of recombination "can lead to the selection or generation of strains capable of switching hosts, posing a threat to human and animal health."[193] Indeed, as Banerjee et al. (2021) noted, "[t]he presence of bats or bat colonies on farms that house SARS-CoV-2-susceptible animals, such as minks . . . should be assessed and a contingency plan developed to restrict contact."[194] This is because "[t]he highly mobile nature and diversity of bats combined with their ability to host viruses in the absence of clinical disease makes them a particular concern for virus persistence and ongoing transmission to other susceptible hosts."[195]

When the virus spreads to other species, it "is likely to acquire adaptive mutations that ensure efficient viral spread in these species."[196] Once the virus has spread widely within a population, and the species has become a new reservoir, it becomes very hard to control it. In a television interview, disease ecologist Barbara Han said she could not name a disease humans have been

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[188] Bas B. Oude Munnink et al., *Jumping Back and Forth: Anthropozoonotic and Zoonotic Transmission of SARS-CoV-2 on Mink Farms*, BIORXIV, Sept. 2020, at 21.
[189] Arinjay Banerjee et al., *Zooanthroponotic Potential of SARS-CoV-2 and Implications of Reintroduction into Human Populations*, 29 CELL HOST & MICROBE 160, 163 (2021).
[190] *Id.*
[191] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 8.
[192] W. Robert Fleischmann, Jr., *Viral Genetics*, *in* MEDICAL MICROBIOLOGY (Baron S. ed., 4th ed. 1996).
[193] Arinjay Banerjee et al., *Zooanthroponotic Potential of SARS-CoV-2 and Implications of Reintroduction into Human Populations*, 29 CELL HOST & MICROBE 160, 162 (2021).
[194] *Id.* at 163.
[195] *Id.*
[196] Markus Hoffman et al., *SARS-CoV-2 Mutations Acquired in Mink Reduce Antibody-Mediated Neutralization*, CELL REPORTS, Apr. 2021, at 5.

able to eradicate once it has reached that point.[197] It is also difficult to predict how the virus would evolve within a host population, or whether it would re-emerge and infect humans or other species, even those who have been previously exposed to SARS-CoV-2 or vaccinated. But that is a distinct risk. By comparison, at least six actively managed livestock diseases in the United States currently "have a wildlife reservoir that is a recognized impediment to eradication due to continued spillover to domestic populations."[198] Indeed, "the risk of reservoir establishment with unforeseeable consequences [was] the basis for the decisions to cull [millions of mink on] farms in the Netherlands and Denmark."[199] Similarly, British Columbia recently announced it would phase out its mink industry, in part due to "concerns the animals would act as a reservoir for the SARS-CoV-2 virus to mutate."[200]

Further, infected mink or infected individuals of other species, like many humans, may be asymptomatic.[201] In other words, they may experience "subclinical" infections with no signs or symptoms of disease. That could make it more difficult to determine whether a species could serve as—or has already become—a permanent reservoir for the virus.[202] As Pomorska et al. (2021) explain, "[I]n minks, clinical and subclinical forms of infection with SARS-CoV-2 can occur, making it potentially problematic to detect. Therefore, mink farms could represent a possibly dangerous, not always recognized, animal reservoir for SARS-CoV-2."[203]

Importantly, variants that develop and emerge in other species can be transmitted not only from infected animals to humans, but also from infected humans to other humans. For example, in 2020, researchers in Denmark observed the emergence of a mink variant that spread first to humans connected to mink farms and then to the community more broadly.[204] Between June and November of that year, the researchers estimated that 27 percent of the 5,159 confirmed human COVID-19 cases in northern Denmark were caused by mink variant strains, and that "at the peak of the epidemic more than half of the strains sequenced from human samples . . . were mink-associated."[205] While the study authors acknowledged that "[t]he Danish experiences are unique because of the magnitude of the Danish mink production," they nonetheless cautioned that "other countries with farmed mink may well experience similar risks."[206]

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[197] Alissa Greenberg, *What's the Deal with Mink Covid?*, PBS NOVA (Mar. 5, 2021), https://www.pbs.org/wgbh/nova/article/mink-covid-virus-mutation/.

[198] Ryan S. Miller et al., *Diseases at the livestock–wildlife interface: status, challenges, and opportunities in the United States*, 110 PREVENTIVE VETERINARY MED. 119 (2013).

[199] Marion Koopmans, *SARS-CoV-2 and the Human-Animal Interface: Outbreaks on Mink Farms*, 21 LANCET 18, 19 (2021).

[200] Stefan Labbé, *B.C. to ban mink farms, citing concerns of new COVID-19 variants*, Times Colonist (Nov. 5, 2021), https://www.timescolonist.com/bc-news/bc-to-ban-mink-farms-citing-concerns-of-new-covid-19-variants-4729636.

[201] Florence Fenollar et al., *Mink, SARS-CoV-2, and the Human-Animal Interference*, FRONTIERS IN MICROBIOLOGY, Apr. 2021, at 5.

[202] Khan Sharun et al., *SARS-CoV-2 in Animals: Potential for Unknown Reservoir Hosts and Public Health Implications*, 41 VETERINARY QUARTERLY 181, 181 (2021).

[203] M. Pomorska-Mól et al., *Review: SARS-CoV-2 Infection in Farmed Minks – an Overview of Current Knowledge on Occurrence, Disease and Epidemiology*, ANIMAL, June 2021, at 7.

[204] Helle Daugaard Larsen et al., *Preliminary Report of an Outbreak of SARS-CoV-2 in Mink and Mink Farmers Associated with Community Spread, Denmark, June to November 2020*, RAPID COMMC'N, Feb. 2021, at 1.

[205] *Id.* at 5.

[206] *Id.*

iii. Manure

In addition to the mink themselves, waste materials produced on mink farms could serve as vectors for the virus. For example, SARS-CoV-2 can be found in infected mink feces.[207] In an interview with Wisconsin Public Radio, Wisconsin state veterinarian Dr. Darlene Konkle acknowledged that "manure and other properties . . . could potentially be a source of the virus."[208] Feces produced by farmed mink typically fall through the wire floors of their cages to the ground below, where they pile up unless or until they are eventually removed and disposed of. Some mink operations dispose of the manure by composting or stockpiling it.[209] If rodents or other wildlife access infected manure while it is in raw piles, or while it is being composted or stored, they could become infected. This would especially be the case if the manure is not properly composted or stored.

Some operations apply manure to fertilize farm lands.[210] For example, earlier this year a mink farm in Oregon was authorized to spread manure that had been infected with the virus on the land surrounding the farm.[211] The Oregon farm first composted the manure "per USDA guidance;"[212] however, it is not clear if it was tested for presence of the virus afterward. Nor is it known whether other farms that spread manure on their land first compost it, compost it correctly, or test it afterward. Fur Commission operating guidelines encourage mink farm operators to "consider composting disease-contaminated manure until safe" because "[t]he spreading of contaminated manure can infect wildlife and greatly increase you [sic] and your neighbor's chances of exposure."[213] Once again, however, those guidelines are not binding; nor do they provide specific instructions on how to correctly compost.

iv. Wastewater and runoff

Another means by which mink farms could spread the virus into the environment is through the discharge of contaminated wastewater or surface water runoff. Indeed, the Fur Commission guidelines describe "[e]xposure to pathogens via . . . water" as "common."[214] For example, they

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[207] Hai Nguyen Tran et al., *SARS-CoV-2 Coronavirus in Water and Wastewater: A Critical Review About Presence and Concern*, ENV'T RSCH., Oct. 2020; Kuldeep Dhama et al., *SARS-CoV-2 Existence in Sewage and Wastewater: A Global Public Health Concern?*, J. ENV'T MGMT., Dec. 2020.
[208] Hope Kirwan, *Wisconsin Farms Working To Vaccinate Mink Against Coronavirus*, WIS. PUB. RADIO (July 8, 2021), https://www.wpr.org/wisconsin-farms-working-vaccinate-mink-against-coronavirus.
[209] FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 4: RECORDS AND PROTOCOLS 55 (2019).
[210] *Pollution Prevention, Water Quality & Mink Farming*, FUR COMM'N USA, https://furcommission.com/pollution-prevention-water-quality-mink-farming/.
[211] E-mail from Ryan P. Scholz, State Veterinarian, Oregon Department of Agriculture – Animal Health Program to Emilio DeBess, State Public Health Veterinarian, Acute and Communicable Disease Program, Oregon State Public Health and Colin Gillin, State Wildlife Veterinarian, Wildlife Health and Population Lab, Oregon Department of Fish and Wildlife (Feb. 8, 2021, 11:11 PST).
[212] *Id.*
[213] JOHN S. EASLEY D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 4 (2019).
[214] *Id.*

explain that "[a] major concern with [re-circulating water systems] is that they can become contaminated and expose all the mink to disease."[215]

SARS-CoV-2 can shed from feces into water,[216] and once in water, it may remain infectious for many days, depending on factors such as the temperature of the water and the concentration of suspended solids.[217] Mink farms may have liquid waste management systems involving manure storage facilities that could overflow.[218] There is also a risk of "[d]irect runoff from feedlots/mink pen areas or stored manure" into nearby waters.[219] Some farm operators may discharge waste directly into streams. For instance, in 2013, the owner of two mink farms in northwestern Washington was fined $48,000 by the Washington Department of Ecology for discharging water contaminated with manure into nearby creeks.[220]

These possibilities are made more concerning by the research of Aguilo-Gisbert et al. (2021). They reported that 2 out of 13 wild mink captured in Spain tested positive for SARS-CoV-2.[221] They concluded it was unlikely that the mink became infected through contact with other infected mink—escaped or wild—for several reasons: The nearest mink farms were several miles away, had "approved anti-escape measures," had not reported any positive cases of SARS-CoV-2, had not reported any escapes during the COVID-19 pandemic, and had mostly white-furred animals (the captured mink were brown). In addition, the two positive animals lived in different river valleys separated by a mountain range, suggesting the mink populations in both valleys were not in frequent contact, and none of the other mink captured in the two populations tested positive. Instead, the study authors theorized that the two positive mink became infected through contact with contaminated wastewaters:

> As American mink very much depend on aquatic environments, a conceivable possibility for explaining the infection with SARS-CoV-2 of our two animals would be that these animals were the subject of sporadic infection by virus present in wastewaters. SARS-CoV-2 is found in the feces of infected humans and is shed into wastewaters. . . . Inappropriate management or leaks from sewage facilities can lead to wastewater being released to surface water bodies, which would convert this type of event into a potential source of infection. . . . The possibility of intermittent

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[215] *Id.*

[216] Jordi Aguilo-Gisbert et al., *First Description of SARS-CoV-2 Infection in Two Feral American Mink (Neovison vison) Caught in the Wild*, ANIMALS, May 2021, at 9; Hai Nguyen Tran et al., *SARS-CoV-2 Coronavirus in Water and Wastewater: A Critical Review About Presence and Concern*, ENV'T RSCH., Oct. 2020, at 1; Kuldeep Dhama et al., *SARS-CoV-2 Existence in Sewage and Wastewater: A Global Public Health Concern?*, J. ENV'T MGMT, Dec. 2020, at 1.

[217] Hai Nguyen Tran et al., *SARS-CoV-2 Coronavirus in Water and Wastewater: A Critical Review About Presence and Concern*, ENV'T RSCH., Oct. 2020, at 1.

[218] *Pollution Prevention, Water Quality & Mink Farming*, FUR COMM'N USA, https://furcommission.com/pollution-prevention-water-quality-mink-farming/.

[219] *Id.*

[220] *WA mink farm fined for manure discharge*, MANURE MANAGER (Apr. 2, 2013), https://www.manuremanager.com/wa-mink-farm-fined-for-manure-discharge-13209/.

[221] Jordi Aguilo-Gisbert et al., *First Description of SARS-CoV-2 Infection in Two Feral American Mink (Neovison vison) Caught in the Wild*, ANIMALS, May 2021, at 1.

> spill outs and of contagion at untreated sewage discharge points rather than in the open river waters, where the virus would be much diluted, together with local and temporal changes in the viral levels in wastewaters, could explain why only 2 of the 13 mink were infected.[222]

In the same way, wastewaters or surface runoff originating from infected mink farms could contaminate nearby waterbodies and put wild species living in or around those waters at risk. For this reason as well, farmed mink qualify as injurious under the Lacey Act.

v. Carcasses

Yet another form of waste generated each year by mink farms are the hundreds or thousands of carcasses from animals that are killed for their fur or that die of disease or injury. According to the Fur Commission, carcasses are "potentially highly contaminated [with pathogens] and infectious to other mink and people."[223] Carcasses must be "handled correctly" because operators "have a duty to protect your neighbors and keep any diseases from being introduced into the wildlife."[224] Yet, incongruously, the Fur Commission acknowledges that carcasses are often widely distributed in ways that could facilitate the spread of disease:

> Some farmers trade [mink carcasses] for fish offal with fishermen who use them as crab bait. . . . Other farmers give the carcasses to people who raise birds of prey or run wildlife preserves, zoos or aquariums. Yet others use them to make organic compost. Or they may be bought and rendered down to provide raw materials for a wide range of products, from tires and paint to makeup and organic fertilizers.[225]

For carcasses that are not sold or given away, Fur Commission guidelines encourage operators to store carcasses in "5-gallon plastic pails with lids" until they can be burned, composted, or buried.[226] It is not clear how secure carcasses are from wildlife if they are dumped in compost piles or buried in the ground, much less if they are stored in plastic buckets. Nor is it clear how many operators adhere to Fur Commission guidelines.

As with manure, if wildlife or other animals on the farm (such as cats or mice) access infected carcasses or waste fur (attached or unattached to the carcasses), they could become infected. Also similar to manure, this is especially the case if carcasses are not composted or disposed of properly. For instance, according to Utah state veterinarian Dr. David Taylor, "Hot composting can kill pathogens, but it has to be done right. . . . After we went onto these [mink] farms and saw what they considered to be composting, which really were just piled-up mink, we made the

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[222] *Id.* at 9-10.
[223] John S. Easley D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 5 (2019).
[224] *Id.*
[225] *Frequently Asked Questions*, Fur Comm'n USA, https://furcommission.com/faq/#:~:text=Mink%20carcasses%20are%20rarely%20eaten,meat%2C%20but%20seals%20hate%20it.
[226] JOHN S. EASLEY D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 5 (2019).

decision here in Utah to just have these [carcasses] buried at landfills."[227] It is not clear whether, or to what extent, landfills are more secure than mink farms from scavenging wildlife.

In an analogous context, Nituch et al. (2011) warned that "improper disposal of pelted mink carcasses, dead-stock, manure and other waste" on mink farms in Canada were potential contributing factors to the spread of Aleutian disease, a highly pathogenic parvovirus affecting mink and other mustelids.[228] Similarly, Bowman et al. (2014) suggested that the "major point of spillover of [the Aleutian disease virus] between mink farms [in Canada] and wildlife is manure and composting carcasses on mink farms," because wildlife sometimes visit manure or carcass compost piles.[229]

vi. Fur

Another potential vector of the virus is mink fur. Boklund et al. (2021) tested multiple samples of fur that had been removed from mink on two different mink farms in Denmark for the presence of SARS-CoV-2; all were positive.[230] Further, Virtanen et al. (2021) found that, while the virus only remained viable for up to a few days on most surfaces, it remained infectious for 10 days or more on mink fur.[231] In fact, SARS-CoV-2 survived so much longer on mink pelts than other surfaces that the study authors raised the possibility that "this stability contributes to the efficient spread of the virus within mink farms."[232] It was not clear to the researchers whether the virus's longevity on mink fur was due to the fur's mechanical or biological properties, or both—though it appeared that, for example, the fur's mechanical properties protected the virus from UV treatment.[233]

This suggests that infected mink fur—whether on live animals, carcasses, pelts, or finished products, and whether in fur farms, compost piles, landfills, or commercial trade—could contribute to the infection of humans and wildlife. Indeed, with respect to trade, the World Organisation for Animal Health ("OIE") has cautioned that "there is insufficient evidence to consider raw mink furskins as safe for international trade, and further research is needed to better understand any risk to human or animal health potentially posed by international trade in contaminated pelts or fur."[234] The European Centre for Disease Prevention and Control has also warned that partially processed furs may not be safe and that trade in raw pelts should be banned:

> When mink are pelted, the drying process and the storage period will reduce the virus load on pelts, although this may not completely inactivate the virus, which

[227] Kate Golden, *The Wild World of Mink and Coronavirus*, SIERRA (Jan. 7, 2021), https://www.sierraclub.org/sierra/wild-world-mink-and-coronavirus.
[228] Larissa A. Nituch et al., *Mink Farms Predict Aleutian Disease Exposure in Wild American Mink*, PLoS ONE, July 2011, at 2.
[229] Jeff Bowman et al., *Testing for Aleutian Mink Disease Virus in the River Otter (Lontra canadensis) in Sympatry with Infected American Mink (Neovison vison)*, 50 J. WILDLIFE DISEASES 689, 689 (2014).
[230] Anette Boklund et al., *SARS-CoV-2 in Danish Mink Farms: Course of the Epidemic and a Descriptive Analysis of the Outbreaks in 2020*, 11 ANIMALS 164 (2021).
[231] Jenni Virtanen et al., *Survival of SARS-CoV-2 on Clothing Materials*, ADVANCES IN VIROLOGY, Apr. 2021, at 1.
[232] *Id.* at 4.
[233] *Id.*
[234] OIE, GUIDANCE ON WORKING WITH FARMED ANIMALS OF SPECIES SUSCEPTIBLE TO INFECTION WITH SARS-COV-2 5 (2021).

> may remain viable on the raw pelts transported to other areas for further processing. Additional contamination of raw pelts by an infected person cannot be excluded. . . . National authorities should consider . . . destroying raw pelts in accordance with appropriate biosecurity measures. A ban on the movement of live mink and raw pelts processed in 2020 within the EU and worldwide should also be considered for as long as SARS-CoV-2 exposure from humans to mink is occurring.[235]

While the chemical tanning or dressing process may inactivate the virus on mink fur, an infected person could re-contaminate the pelt or fur on a finished product through physical handling or respiratory droplets. This could put consumers and others who handle even fully processed mink furs or fur products at risk. In an analogous context, Han and Liu (2021) determined that imported cold food is a major cause for the recurrence and spread of COVID-19 in China.[236] They found that the virus can survive nearly three weeks on cold food and food packaging materials and that, during long-distance shipping, such materials are likely to become contaminated by infected workers, posing a threat to others further down the supply chain:

> Overall we found that SARS-CoV-2 virus can survive 20 days through cold chain transportation with low temperature, and the contaminated cold food or food packaging material can transmit the SARS-CoV-2 virus along the cold chain logistics through "person-to-thing-to-person" transmission not just through "person-to-person."[237]

In the same way, "person-to-thing-to-person" transmission and infection of the virus could occur along the mink pelt and mink fur product supply chains.

Evidence indicates that the SARS-CoV-2 virus can survive for unusually long periods of time on mink fur, that raw and even partially processed mink pelts pose a significant threat to human health, and that even fully processed mink pelts or other products containing mink fur could become contaminated if they are handled by infected individuals while in transit, putting consumers and others who interact with those products at risk. Accordingly, the USFWS should prohibit the importation, transportation, and acquisition of not only live mink, but also of dead mink and any parts containing fur.

F. Impact on threatened and endangered species

The fourth factor the USFWS considers to assess injuriousness is "impacts to threatened and endangered species and their habitats." 81 Fed. Reg. at 1538.[238] Captive mink[239] could adversely impact threatened and endangered species in two ways. First, escaped mink infected with the SARS-CoV-2 virus could transmit it to a listed species. For instance, Canada lynx (*Lynx*

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[235] ECDPC, DETECTION OF NEW SARS-COV-2 VARIANTS RELATED TO MINK 9, 12 (2020).
[236] Shilian Han and Xinwang Liu, *Can imported cold food cause COVID-19 recurrent outbreaks? A review*, ENV'T CHEMISTRY LETTERS, Sept. 2021.
[237] *Id.* at 5.
[238] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.
[239] This section, and the petition as a whole, explains why captive mink are injurious.

canadensis) and grizzly bears (*Ursos arctos horribilis*), both of which are listed as threatened, *see* 50 C.F.R. § 17.11(h), occur or may be present in several states where mink farms are located.[240] These apex predators may prey on infected escaped mink[241] and contract the disease.[242] Similarly, Pacific martens (*Martes caurina*), listed as threatened in coastal areas of Oregon and California, *see* 50 C.F.R. § 17.11(h), could come into contact with infected escaped mink and contract the disease. Analogously, stone martens (*Martes foina*) and pine martens (*Martes martes*) in France have been exposed to Aleutian disease in areas where they overlap with escaped American mink.[243]

Second, escaped mink could harm listed species through predation. For example, roseate terns (*Sterna dougallii dougallii*), which are listed as endangered, *see* 50 C.F.R. § 17.11(h),[244] occur in the northeast region of the United States (including New Hampshire, New York, Pennsylvania, and Virginia, where there are mink farms[245]). Mink prey upon roseate terns.[246] In New Hampshire alone, "mink have invaded 5 common and roseate tern colonies, resulting in dramatic loss of common and roseate terns and the abandonment of tern colonies" from several islands in the state.[247]

In the Great Lakes area, the piping plover (*Charadrius melodus*) is listed as an endangered species. *See* 50 C.F.R. § 17.11(h).[248] The species is known or believed to occur in Illinois, Michigan, Ohio, and Wisconsin, where there are many reported fur farms. Mink prey upon piping plover, and the abundance and reproductive success of the piping plover "can be limited by predation."[249]

The northern population segment of the copperbelly water snake (*Nerodia erythrogaster neglecta*) (found in southern Michigan, northeastern Indiana, and northwestern Ohio) is listed as

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[240] *See, e.g.*, U.S. DEP'T AGRIC. & U.S. DEP'T INTERIOR, BIOLOGICAL ASSESSMENT OF THE LYNX AND LAND MANAGEMENT PLANS: AN ASSESSMENT OF POTENTIAL EFFECTS fig. 3, https://www.fws.gov/mountain-prairie/es/species/mammals/lynx/BA%20Figure%203%20primary%20habitat.jpg.
[241] *See, e.g.*, *American Mink*, ALASKA DEPT. OF FISH & GAME, http://www.adfg.alaska.gov/index.cfm?adfg=americanmink.printerfriendly.
[242] *See, e.g.*, R.J. Delahay et al., *Assessing the Risks of SARS-CoV-2 in Wildlife*, ONE HEALTH OUTLOOK, Apr. 2021, at 6 ("Scavenging and predation on other potentially susceptible mammals could provide opportunities for spillover [of SARS-CoV-2] into wild mustelid populations . . . .").
[243] Christine Fournier-Chambrillon et al., *Antibodies to Aleutian Mink Disease Parvovirus in Free-Ranging European Mink (*Mustela Lutreola*) and other Small Carnivores from Southwestern France*, 40 J. WILDLIFE DISEASES 394 (2004).
[244] *Roseate tern (Sterna dougallii dougallii)*, U.S. FISH & WILDLIFE SERV., https://ecos.fws.gov/ecp/species/2083.
[245] BORN FREE USA, SILENT SUFFERING IN OWN BACKYARD: FUR FARMING IN THE UNITED STATES 13 (2020); *see also North Atlantic-Appalachian Region*, U.S. FISH & WILDLIFE SERV. (Dec. 29, 2020), https://www.fws.gov/northeast/.
[246] N.H. FISH & GAME, NEW HAMPSHIRE WILDLIFE ACTION PLAN, APPENDIX A 317 (2015).
[247] *Id.*
[248] *See also Piping Plover (Charadrius melodus)*, U.S. FISH & WILDLIFE SERV., https://ecos.fws.gov/ecp/species/6039.
[249] Michelle L. Stantial et al., *The Effect of Top Predator Removal on the Distribution of a Mesocarnivore and Nest Survival of an Endangered Shorebird*, AVIAN CONSERVATION & ECOLOGY, 2021, at 2 (2021).

threatened. *See* 50 C.F.R. § 17.11(h).[250] Population declines in this area have been attributed, in part, to predation.[251] Mink are natural predators of this snake, and mink farms are located in Michigan and Ohio. [252]

The bog turtle (*Clemmys muhlenbergii*) is a threatened species, *see* 50 C.F.R. § 17.11(h), known or believed to occur in New York and Pennsylvania, where there are also fur farms.[253] The "predominant predators of nests and juveniles" include mink, and predation is reported to be a threat to the species.[254]

And in southeastern states, imperiled mussels "are threatened by predation from . . . mink."[255] The Appalachian elktoe (*Alasmidonta raveneliana*), an endangered mussel found in North Carolina (where there is a fur farm), *see* 50 C.F.R. § 17.11(h), is "presumably consumed by . . . mink."[256] There are also endangered mussel species, such as the northern riffleshell (*Epioblasma rangiana*) and clubshell mussel (*Pleurobema clava*), *see* 50 C.F.R. § 17.11(h), in other states that have mink farms, including Illinois and New York.[257]

In light of the myriad threatened and endangered species that inhabit geographical areas in which mink fur farms exist, including species known to constitute prey for mink, there are various ways in which escaped mink could threaten harm to these species and the habitat essential to their survival and recovery. For this reason, action is warranted to list mink in trade as injurious under the Lacey Act.

G. Wildlife or habitat damages that may occur from control measures

The sixth factor the USFWS considers in determining injuriousness is "wildlife or habitat damages that may occur from control measures." 81 Fed. Reg. at 1538.[258] Captive mink should

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[250] *See also Copperbelly water snake (Nerodia erythrogaster neglecta),* U.S. FISH & WILDLIFE SERV., https://ecos.fws.gov/ecp/species/7253.
[251] *Copperbelly Water Snake (Nerodia erythrogaster neglecta)*, U.S. FISH & WILDLIFE SERV. (May 29, 2019), https://www.fws.gov/midwest/endangered/reptiles/cws/cwsFactSht.html.
[252] MICHIGAN NATURAL FEATURES INVENTORY, COPPERBELLY WATER SNAKE 5 (2010); BORN FREE USA, SILENT SUFFERING IN OWN BACKYARD: FUR FARMING IN THE UNITED STATES 13 (2020).
[253] *Bog Turtle*, U.S. FISH & WILDLIFE SERV., https://ecos.fws.gov/ecp/species/6962; BORN FREE USA, SILENT SUFFERING IN OWN BACKYARD: FUR FARMING IN THE UNITED STATES 13 (2020).
[254] PA. FISH & BOAT COMM'N, SPECIES ACTION PLAN: BOG TURTLE 5 (2011).
[255] Endangered and Threatened Wildlife and Plants; Partial 90-Day Finding on a Petition to List 404 Species in the Southeastern United States as Endangered or Threatened with Critical Habitat, 76 Fed. Red. 59,835 (Sept. 27, 2011).
[256] Endangered and Threatened Wildlife and Plants; Appalachian Elktow Determined to be an Endangered Species (Nov. 23, 1994), https://www.govinfo.gov/content/pkg/FR-1994-11-23/html/94-28935.htm; BORN FREE USA, SILENT SUFFERING IN OWN BACKYARD: FUR FARMING IN THE UNITED STATES 13 (2020).
[257] Jen Mui, *Northern Riffleshell*, ILL. NAT. HIST. SURV., https://www.inhs.illinois.edu/outreach/spotlight/northern-riffleshell/; T.J. Pignataro, *Endangered mussels seem to thrive in new home in Cassadaga Creek*, BUFFALO NEWS (Sept. 1, 2017), https://buffalonews.com/news/local/endangered-mussels-seem-to-thrive-in-new-home-in-cassadaga-creek/article_301ac3fc-d5e1-5279-aab5-d4a10a13cd62.html; BORN FREE USA, SILENT SUFFERING IN OWN BACKYARD: FUR FARMING IN THE UNITED STATES 13 (2020).
[258] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.

be considered injurious because lethal control measures used to try to remove escaped mink from the wild would likely cause significant damage to wild mink and other wildlife. That is because such control measures would likely include the use of traps or snares. Indeed, steel-jaw leghold traps, body-gripping traps, and neck snares are currently used by the federal government to kill mink and many other species each year in the name of animal damage management.[259] However, traps and snares are harmful and cause damage to wildlife in many ways.

First, these devices are inhumane. For example, some neck snares are designed to kill the captured animal by tightening continuously as the animal struggles until strangulation occurs. However, this can take hours, if not days, causing extreme and prolonged agony for the captured animal, including from grotesque swelling of the neck, head, and eyes, referred to by trappers as "jellyhead."[260] In his book *Intolerable Cruelty*, Dr. Gilbert Proulx reported a coyote caught in a killing neck snare taking more than 14 hours to die, and a wolf caught in a killing neck snare taking more than 3 hours to die.[261] Both animals struggled intensely and chewed on the cable, cutting their tongues and gums.[262] "Simply put," wrote Proulx, "these 2 animals had been tortured."[263]

Other neck snares are designed to restrain. They hold the captured animal by his or her neck until the trapper arrives to kill the animal, unless the animal has died due to injuries caused by the trap, exposure to the elements, stress, or predation. Many states allow multiple days to pass between trap or snare inspections—and some states have no general trap or snare check requirements at all.[264] The policy of USDA Wildlife Services—the federal program that may be most likely to conduct lethal control of mink or other wildlife infected with SARS-CoV-2—is to check trapping devices "no less frequently than required by state law."[265] Thus, in states with longer or no trap check requirements, it is likely that animals would suffer for days in traps or snares before being killed, regardless of who was conducting the lethal control.

Steel-jaw leghold traps are also inhumane. Many trapped animals will violently fight the trap after being caught, often biting at the device, which can result in broken teeth and gum damage in addition to the damage to the captured limb, including lacerations, strained and torn tendons and ligaments, extreme swelling, broken bones, and self-amputation.[266] In the summer heat, many animals cannot survive for long without water. In harsh winter conditions, animals can lose a limb or freeze to death after being caught. Prolonged constriction of a limb in a trap can cut off or severely restrict blood supply to the affected appendage, potentially causing the appendage to

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[259] *Program Data Report G- 2020*, U.S. DEP'T OF AGRIC., https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/pdr/?file=PDR-G_Report&p=2020:INDEX:.
[260] GILBERT PROULX, INTOLERABLE CRUELTY: THE TRUTH BEHIND KILLING NECK SNARES AND STRYCHNINE 28 (Alpha Wildlife Productions 2017).
[261] *Id.* at 7-17.
[262] *Id.*
[263] *Id.* at 16.
[264] Gilbert Proulx & Dwight Rodtka, *Killing Traps and Snares in North America: The Need for Stricter Checking Time Periods*, ANIMALS, Aug. 2018, at 9-13. The states with no general trap check laws are Alaska, Montana, and North Dakota.
[265] APHIS Directive WS 2.450, Traps and Trapping Devices (U.S.D.A. 2021).
[266] *See. e.g.*, G. Iossa et al., *Mammal Trapping: A Review of Animal Welfare Standards of Killing and Restraining Traps*, 16 ANIMAL WELFARE 335, Table 2 (2007).

be lost due to gangrene. For these reasons, steel-jaw leghold traps have been condemned as inhumane by both the National Animal Care and Control Association[267] and the American Animal Hospital Association.[268]

Iossa et al. (2007) provided an extensive review of the injury rates associated with multiple trap types, including padded, off-set, enclosed, and unpadded steel-jaw leghold traps.[269] Leghold traps resulted in minor injuries more than 50 percent of the time in the majority of studies reviewed. They also frequently caused major injuries, such as to river otters (56 percent of the time when various sizes and models of leghold traps were used), raccoons (74 percent of the time when unpadded leghold traps were used), and gray foxes (61 percent of the time when unpadded leghold traps were used).

Enclosed leghold traps (dog-proof traps) are particularly inhumane for raccoons, who experience excruciating pain when one of their front feet is caught due to the hypersensitivity of those limbs. While such traps, given their design, are intended to reduce bycatch of nontarget species, feral cats and any species with a small paw able to reach into the trap to access the bait and pull up on the trigger bar could be captured. Despite reducing the potential for nontarget captures, enclosed leghold traps can result in serious injuries, including amputations.[270]

Body-grip traps are similarly cruel. In theory, they are designed to kill mammals instantly by crushing their necks or torsos. According to Iossa et al. (2007),[271] for a kill trap to satisfy humaneness criteria in North America, 70 percent of animals should be rendered unconscious within 180 seconds or less for most species.[272] Yet, a majority of the killing traps reviewed in the study, including a variety of different models of body-grip traps, failed to meet that standard.

In a more recent study, Proulx and Rodtka (2019) explained that, while the Conibear 120 is one of the most commonly used traps to kill mink, it is incapable of consistently or humanely doing so:

> [T]he Conibear 120 rotating-jaw trap is most popular among [mink] trappers. In the USA, the Conibear 120 trap is recommended in [best management practices] for trapping mink, and neck strikes are identified as proper strike locations. However, . . . [mink] cannot be humanely killed, i.e., lose consciousness in ≤3 min . . . by the Conibear 120 trap. In fact, even the mechanically superior and stronger C120 Magnum failed to humanely kill mink captured by the neck. . . . Because the two-prong trigger fails to ensure strikes in vital regions, and the Conibear 120 trap does

[267] NAT'L ANIMAL CARE & CONTROL ASS'N, NACA GUIDELINES 7 (2014), https://www.nacanet.org/wp-content/uploads/2019/03/NACA_Guidelines.pdf.
[268] *Leghold Traps*, AM. ANIMAL HOSP. ASS'N, https://www.aaha.org/about-aaha/aaha-position-statements/leghold-traps/ (2014).
[269] G. Iossa et al., *Mammal Trapping: A Review of Animal Welfare Standards of Killing and Restraining Traps*, 16 ANIMAL WELFARE 335, Tables 4, 5 (2007).
[270] George F. Hubert, Jr. et al., *Evaluation of Two Restraining Traps to Capture Raccoons*, 24 WILDLIFE SOC'Y BULL. 4, Table 4 (1996).
[271] G. Iossa et al., *Mammal Trapping: A Review of Animal Welfare Standards of Killing and Restraining Traps*, 16 ANIMAL WELFARE 335 (2007).
[272] *Id.* at 337 (citing Powell and Proulx 2003's proposed criteria).

> not have the striking and clamping forces to produce a humane kill, many mink captured in this trap stay alive for many hours, and sometimes until the following day. Thousands of mink are trapped every year in North America, and many of those captured in the Conibear 120 trap must experience pain and suffering for periods of time exceeding [the Agreement on International Humane Trapping Standards'] time limit of 5 min.[273]

Finally, traps and snares capture and kill nontarget animals. Regarding snares, for instance, between 1990 and 2014, the Canadian Wildlife Health Cooperative received 157 reports of nontarget captures involving individuals of 16 different species that were unintentionally caught and injured or killed in killing neck snares set in Canada.[274] Of course, "this probably represents a small proportion of the snared animals that die and go undetected or unreported by people."[275]

Leghold traps can also capture and kill nontarget animals. For example, Andreasen et al. (2018) examined cause-specific mortality in mountain lions unintentionally caught in leghold traps set for bobcats from 2009 through 2015 in their study site in Nevada.[276] They found that if female mountain lions were captured in leghold traps, it directly reduced their survival by causing injuries that made the animals more susceptible to other forms of mortality. Of the 48 lions originally included in the study, 33 died during its seven-year duration. Of those 33 lions, seven died as a consequence of nontarget trapping (five were caught in leghold traps and two in snares).

Traps and snares can also harm rare and imperiled species. For example, in a 2013 conservation assessment of Canada lynx—which are listed as threatened under the ESA (*see* 50 C.F.R. § 17.11(h))—the USFWS cited multiple studies indicating that, "[l]ike most felids, lynx are very vulnerable to trapping and snaring and can be easily overexploited (Mech 1980, Carbyn and Patriquin 1983, Parker et al. 1983, Ward and Krebs 1985, Bailey et al. 1986, Quinn and Thompson 1987, Slough and Mowat 1996)."[277]

The lack of selectivity with body-gripping traps is also consistently noted in the published literature. Linscombe (1976)[278] documented 57 nontarget mammals and 127 nontarget birds captured in No. 2 Victor and No. 220 Conibear traps. In his study of multiple trap types in Arkansas, Sasse (2018)[279] found that non-target spotted skunks, a species of "greatest

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[273] Gilbert Proulx and Dwight Rodtka, *Killing Traps and Snares in North America: The Need for Stricter Checking Time Periods*, 9 ANIMALS 570 (2019).
[274] Those species were: black bear; bobcat; Canada lynx; fisher; mountain lion; snowshoe hare; white-tailed deer; wolverine; bald eagle; golden eagle; barred owl; great horned owl; goshawk; red-tailed hawk; rough-legged hawk; and raven. *See* Gilbert Proulx et al., *Humaneness and Selectivity of Killing Neck Snares Used to Capture Canids in Canada: A Review*, 4 CANADIAN WILDLIFE BIOLOGY & MGMT. 55, Table 1 (2015).
[275] *Id.* at 60-61.
[276] Alyson M. Andreasen et al., *Survival of Cougars Caught in Non-Target Foothold Traps and Snares*, 82 J. WILDLIFE MGMT. 906, 906 (2018).
[277] INTERAGENCY LYNX BIOLOGY TEAM, CANADA LYNX CONSERVATION ASSESSMENT AND STRATEGY 3RD EDITION – AUGUST 2013 79 (2013).
[278] GREG LINSCOMBE, LA. WILDLIFE & FISHERIES COMM'N, AN EVALUATION OF THE NO. 2 VICTOR AND 220 CONIBEAR TRAPS IN COASTAL LOUISIANA 563 (1976).
[279] D. Blake Sasse, *Incidental Captures of Plains Spotted Skunks (Spilogale putorius interrupta) By Arkansas Trappers*, 72 J. ARK. ACAD. SCIENCE 187, 188 (2018).

conservation need" in Arkansas and that may warrant protection under the ESA,[280] were captured in body-gripping traps set for bobcats, raccoons, coyotes, and foxes. And, referring specifically to traps set for feral mink in the Cape Horn Biosphere Region, Davis et al. (2012) argued that "it is inefficient, ineffective and even unethical to continue the use of body-gripping lethal traps within open front cubby set[s] . . . given the high mortality of various non-target species."[281]

In sum, setting traps and snares to conduct lethal control of mink or other species infected with the SARS-CoV-2 virus would risk causing severe damage to wildlife due to injuries and unintentional mortalities to target and nontarget animals. This is an outcome the USFWS has sought to avoid in the past. For example, the agency prohibited the import of several snake species, in part, to avoid having to use traps to capture escaped snakes, because of the negative effects that traps could have on nontarget species. *See* 80 Fed. Reg. at 12,714. Similarly, the USFWS prohibited the import of salamanders, in part, to avoid the need to use chemical treatments to eradicate diseased salamanders in the wild, which the agency expected could have "severe" effects on other wildlife. *See* 81 Fed. Reg. at 1551. To help avoid a similar scenario resulting from the use of lethal measures to control escaped captive mink, the USFWS should proactively prohibit the importation, transportation, and acquisition of mink in trade.

VI. The Remaining Evaluation Criteria Do Not Reduce the Likelihood that Mink in Trade Will Be Considered Injurious

Under the USFWS's Injurious Wildlife Evaluation Criteria, the factors discussed above contribute to the injuriousness of a species, while the factors that follow may reduce the likelihood of a species being considered as injurious. *See* 81 Fed. Reg. at 1538.[282] As discussed below, none of the following factors reduce the injuriousness of mink in trade.

A. Ability to prevent escape and establishment

The first factor is "ability to prevent escape and establishment." 81 Fed. Reg. at 1538.[283] It is unlikely that fur farms can provide 100 percent assurance that no mink will ever escape. As discussed above, captive mink regularly escape in countries where they are raised. In the United States, there are no federal and few state regulations requiring fur farms to implement biosecurity measures such as effective perimeter fencing that keep mink in and wildlife out.[284] Fur Commission guidelines recommend that all mink farms have a "well designed and managed perimeter fence" that is at least six feet tall, has three electric wires, and has a maximum of 1.5-inch square mesh. The guidelines emphasize the importance of the perimeter fence:

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[280] *Prairie Gray Fox, Plains Spotted Skunk May Warrant Protection Under the Endangered Species Act; U.S. Fish and Wildlife Service to Review Species' Status*, U.S. FISH & WILDLIFE SERV. (Dec. 5, 2012), https://www.fws.gov/midwest/news/606.html.
[281] Ernesto F. Davis et al., *American Mink (Neovison vison) Trapping in the Cape Horn Biosphere Reserve: Enhancing Current Trap Systems to Control an Invasive Predator*, 49 ANNALS ZOOLOGICI FENNICI 18, 21 (2012).
[282] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.
[283] *See also id.*
[284] BORN FREE USA, SILENT SUFFERING IN OWN BACKYARD: FUR FARMING IN THE UNITED STATES 10 (2020).

> The three main requirements of the perimeter fence are to keep wildlife from entering the farm, to keep the mink from leaving the farm, and to limit the entrance of people to very specific entrances. The ability of the fence to be a barrier to wild-life [sic] cannot be overstated. Many disease outbreaks have been shown to have been transmitted by wildlife (raccoons, skunks, rodents, birds, feral cats, etc.) that have entered the farm through a non-existing or faulty functioning perimeter fence.[285]

Despite this warning, mink continue to escape from farms in the United States. As discussed above, at least one mink has escaped from a fur farm in Oregon that was already under quarantine because of a SARS-CoV-2 outbreak among mink and humans on the farm.[286] If mink can escape from farms under quarantine where, according to CDC guidelines, "maximum biosecurity" measures are required,[287] it is likely they will continue to escape from less secure facilities, particularly those containing thousands or tens of thousands of animals.

It is not clear how likely it is that escaped mink would become established in the wild in the United States. Petitioners are unaware of any studies regarding whether or to what extent escaped mink have survived in the wild, interacted or hybridized with wild mink, or otherwise affected wild mink populations in the United States. However, because mink are native to, and already established in, North America, it is not necessary for feral populations of escaped mink to become established to cause harm. As discussed above, even if the period of survival is limited, individual escaped mink can adversely affect wild mink and other wildlife through hybridization, competition, predation, and transmission of the SARS-CoV-2 virus.

Further, it is not necessary for farmed mink to escape at all to pose a threat. Captive mink that become infected with SARS-CoV-2 can transmit the virus to humans and potentially other domestic or wild animals that inhabit or enter the farm. Such transmission could result in spread of the virus to other animals, other mink farms, and human communities. As a result, even if infected farmed mink do not escape or become established in the wild, the virus would still present a danger to human and animal health.

B. Potential to eradicate or manage established populations

The second factor is "potential to eradicate or manage established populations." *See* 81 Fed. Reg. at 1538.[288] It would be difficult to eradicate feral mink populations, both because mink are small

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[285] JOHN S. EASLEY D.M.V., FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 2 (2019).
[286] April Ehrlich, *Mink infected with the coronavirus escapes Oregon fur farm*, OPB (Dec. 29, 2020), https://www.opb.org/article/2020/12/29/coronavirus-mink-oregon/.
[287] CDC, RESPONSE & CONTAINMENT GUIDELINES: INTERIM GUIDANCE FOR ANIMAL HEALTH AND PUBLIC HEALTH OFFICIALS MANAGING FARMED MINK AND OTHER FARMED MUSTELIDS WITH SARS-COV-2 6 (2020), https://www.aphis.usda.gov/publications/animal_health/sars-cov-2-mink-guidance.pdf.
[288] *See also id.*

and elusive, and because mink farms would provide a continuous source of new escapees. Even if it were possible, it would be unacceptable to attempt to eradicate an established population of escaped or feral mink, particularly where they share habitat with wild mink, because this could result in a reduction or eradication of the naturally occurring native mink species. It would also be unacceptable to use any of the snares or traps discussed above to attempt to control escaped or wild mink because doing so would also risk causing damage through injury and unintentional mortality to target and nontarget animals. The USFWS should act preemptively and list live and dead mink in trade, including parts containing fur, as injurious, which would help to avoid the harms discussed above.

C. Ability to rehabilitate disturbed ecosystems

The third factor is "ability to rehabilitate disturbed ecosystems." *See* 81 Fed. Reg. at 1538.[289] Some of the ecological damage caused by escaped mink could be rehabilitated by preventing or reducing the number of mink that escape, such as through requiring farms to adhere to stricter biosecurity measures or phasing out the industry altogether. However, if mink farms or escaped mink transmit the virus to other wildlife, and the virus then becomes permanently established in those populations, it may be very difficult to eliminate the virus or rehabilitate those populations.

D. Ability to prevent or control the spread of pathogens or parasites

The fourth factor is "ability to prevent or control the spread of pathogens or parasites." *See* 81 Fed. Reg. at 1538.[290] Vaccinating farmed mink may help with reducing the spread of the SARS-CoV-2 virus, but it is unlikely to prevent transmission entirely, and in some ways could make things worse. The veterinary pharmaceutical company Zoetis began developing a SARS-CoV-2 vaccine for dogs and cats when the first case of a domestic dog becoming infected was reported in Hong Kong in early 2020.[291] When farmed mink began to be infected, the company requested and received permission from the USDA to test the vaccine in mink.[292] In May, the Wisconsin Department of Agriculture, Trade and Consumer Protection approved use of the vaccine.[293] In July, the Oregon Department of Agriculture issued an emergency rule requiring all mink farmers to vaccinate their animals against COVID-19 by the end of August.[294]

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289 *See also id.*
290 *See also id.*
291 James Gorman, *The Coronavirus Kills Mink, So They Too May Get a Vaccine*, N.Y. TIMES (Jan. 22, 2021), https://www.nytimes.com/2021/01/22/science/covid-mink-vaccine.html?searchResultPosition=1.
292 *Id.*
293 Hope Kirwan, *Wisconsin Farms Working To Vaccinate Mink Against Coronavirus*, WIS. PUB. RADIO (July 8, 2021), https://www.wpr.org/wisconsin-farms-working-vaccinate-mink-against-coronavirus.
294 George Plaven, *Oregon requires coronavirus vaccines for farmed mink*, CAPITAL PRESS (June 8, 2021), https://www.capitalpress.com/state/oregon/oregon-requires-coronavirus-vaccines-for-farmed-mink/article_22ecec6e-c7d1-11eb-ad2d-13af70da5480.html.

It is not clear how many mink have been vaccinated to date. As of July 5, 2021, the Fur Commission claimed that mink farmers had vaccinated about 500,000 mink.[295] Around the same time, a consultant for the mink industry indicated that mink operations representing about 95 percent of mink in the United States had committed to vaccinating their animals.[296] Even if that were achieved, it would leave tens, and possibly hundreds, of thousands of unvaccinated mink on an unknown number of farms in an unknown number of states.

Even if 100 percent of mink were vaccinated, and assuming it was efficacious in mink, it would likely not eliminate infection or spread of the virus. Indeed, according to Fur Commission operating guidelines, "[e]ven the best vaccination programs may only protect 90% of the animals . . . ."[297] While SARS-CoV-2 vaccines available for humans have proven highly effective at reducing severe illness,[298] they are less effective at preventing infection and transmission of asymptomatic or less severe symptomatic forms of the disease.[299] In other words, the human vaccines provide "effective" but not "sterilizing" immunity—a result that is not surprising, and that should inspire caution:

> There are two main types of immunity you can achieve with vaccines. One is so-called "effective" immunity, which can prevent a pathogen from causing serious disease, but can't stop it from entering the body or making more copies of itself. The other is "sterilising immunity", which can thwart infections entirely, and even prevent asymptomatic cases. The latter is the aspiration of all vaccine research, but surprisingly rarely achieved. . . . In fact, most vaccines don't fully protect against infection, even if they can block symptoms from appearing. As a result, vaccinated people can unknowingly carry and spread pathogens. Occasionally, they can even start epidemics.[300]

In the same way, while they may be helpful, the vaccines for mink are unlikely to be a panacea against transmission and spread of the virus. There does not yet appear to be any publicly available data documenting the effectiveness of the vaccine in the mink populations that have received it.[301]

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[295] Kristian Foden-Vencil, *Oregon makes ranchers vaccinate their mink against COVID-19*, OPB (July 5, 2021), https://www.opb.org/article/2021/07/05/oregon-department-of-agriculture-emergency-rule-mink-vaccines-covid-19/.
[296] Hope Kirwan, *Wisconsin Farms Working To Vaccinate Mink Against Coronavirus*, WIS. PUB. RADIO (July 8, 2021), https://www.wpr.org/wisconsin-farms-working-vaccinate-mink-against-coronavirus.
[297] FUR COMM'N USA, STANDARD GUIDELINES FOR THE OPERATION OF MINK FARMS IN THE UNITED STATES BOOK 3: BIOSECURITY PROTOCOLS FOR MINK FARMS IN THE UNITED STATES 3 (2019).
[298] *COVID-19 Vaccines and Vaccination*, CDC (Sept. 15, 2021), https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/fully-vaccinated-people.html.
[299] *Id.*
[300] Zaria Gorvett, *Can you still transmit Covid-19 after vaccination?*, BBC (Feb. 3, 2021), https://www.bbc.com/future/article/20210203-why-vaccinated-people-may-still-be-able-to-spread-covid-19.
[301] Hope Kirwan, *Wisconsin Farms Working To Vaccinate Mink Against Coronavirus*, WIS. PUB. RADIO (July 8, 2021), https://www.wpr.org/wisconsin-farms-working-vaccinate-mink-against-coronavirus; Natasha Daly, *Bears, baboons, tigers are getting COVID vaccines at zoos across the U.S.*, NAT'L GEOGRAPHIC (Aug. 20, 2021), https://www.nationalgeographic.com/animals/article/bears-baboons-tigers-are-getting-covid-vaccines-at-zoos-across-the-us.

There may also be drawbacks with vaccinating mink. If the vaccine makes it harder to detect the presence of the virus in captive mink populations (because fewer mink will show symptoms), it could (1) result in undetected reservoirs for the virus, (2) increase the risk of mutations, and (3) encourage vaccine-resistant mutations.[302] As Dr. Scott Weese of the Ontario Veterinary College's Center for Public Health and Zoonoses explains:

> [First,] [i]f a vaccine just reduces disease but not infection, that's good for the individual mink, but could be bad for people. It would mean the mink are still susceptible to infection . . . . If the virus then spreads widely and silently on the farm because the mink aren't getting sick, it's harder to detect and control. That means farms may be more likely to become silent reservoirs of the virus. . . .
>
> [Second,] [v]irus mutations are random events, but the more a virus spreads and replicates, the greater the risk that these random events can occur. . . . If the virus is circulating silently on a farm, it is likely to do so for longer before it's detected and brought under control, providing more opportunity for mutant strains to emerge. . . .
>
> [Third,] [a] vaccine that's only marginally effective might actually help select for vaccine-resistant mutants of the virus. The big concern with that is if those mink vaccine-resistant mutants are also resistant to human vaccines, and then they spread to people, then that strain could spread even within the vaccinated human population.[303]

Thus, while vaccines may help to prevent the spread of SARS-CoV-2 to an extent, it is important to acknowledge their potential downsides, and to acknowledge that they are only one component of a much-needed, broader strategy to address the risks of virus spread and transmission.

E. Any potential ecological benefits to introduction

Finally, the fifth factor is "any potential ecological benefits to introduction." *See* 81 Fed. Reg. at 1538.[304] It does not appear that there are any ecological benefits of introducing captive mink into the wild, or allowing them to continue to escape into the wild. On the contrary, as discussed above, doing so would likely adversely affect wild mink and other wildlife, including threatened and endangered species, based on the best available scientific evidence.

[302] Scott Weese, *Mink Vaccination Against SARS-CoV-2: Good or Bad?*, WORMS & GERMS BLOG (Feb. 10, 2021), https://www.wormsandgermsblog.com/2021/02/articles/animals/other-animals/mink-vaccination-against-sars-cov-2-good-or-bad/.

[303] *Id.*

[304] *See also* U.S. FISH & WILDLIFE SERV., LACEY ACT EVALUATION CRITERIA (2001), https://www.fws.gov/fisheries/ANS/pdf_files/Lacey_Act_Eval_Criteria_%20FINAL.pdf.

VII. Request for Rulemaking

As discussed above, the Lacey Act authorizes the USFWS to designate as injurious any "species of wild mammals, wild birds, fish (including mollusks and crustacea), amphibians, [and] reptiles." 18 U.S.C. § 42(a)(1). The Act does not limit the agency to listing only live or whole animals. Thus, the USFWS has exercised its discretion to list live specimens of some taxa, and live and dead specimens, and parts thereof, of other taxa, depending on the threats posed by the individual species or taxonomic groups. Specifically, to date, the agency has listed live specimens of mammals (50 C.F.R. § 16.11), birds (50 C.F.R. § 16.12), and reptiles (50 C.F.R. § 16.15), while it has listed both live and dead specimens, and parts thereof, of fish, mollusks, crustaceans (50 C.F.R. § 16.14), and amphibians (50 C.F.R. § 16.15).

Just as with fish, mollusks, crustaceans, and amphibians, the USFWS has the authority to list species of live and dead mammals, and parts thereof, so long as they are injurious. As explained above, live mink in trade are injurious because, if they escape, they could adversely impact wild mink and other wildlife through hybridization, competition, disease transmission, and predation. Live and dead mink in trade, and their parts, are also injurious because the SARS-CoV-2 virus could be transmitted to humans or wildlife through live animals, their carcasses, their fur, or their manure.

Accordingly, we respectfully request that the USFWS designate live and dead mink in trade, and any parts thereof containing fur, as injurious, by amending its regulations implementing the Lacey Act as follows (revisions in red):

§ 16.11 Importation of live or dead wild mammals.

> (a) The importation, transportation, or acquisition is prohibited of live specimens of: (1) Any species of so-called "flying fox" or fruit bat of the genus Pteropus; (2) any species of mongoose or meerkat of the genera Atilax, Cynictis, Helogale, Herpestes, Ichneumia, Mungos, and Suricata; (3) any species of European rabbit of the genus Oryctolagus; (4) any species of Indian wild dog, red dog, or dhole of the genus Cuon; (5) any species of multimammate rat or mouse of the genus Mastomys; (6) any raccoon dog, Nyctereutes procyonoides; ~~and~~ (7) any brushtail possum, Trichosurus vulpecula; and (8) any American mink, Neovison vison, as well as any dead specimens, or parts thereof containing fur: *Provided*, that the Director shall issue permits authorizing the importation, transportation, and possession of such mammals under the terms and conditions set forth in § 16.22.

VIII. Conclusion

As detailed above, the best available evidence demonstrates that mink in trade are injurious because of the threat they pose to humans and wildlife. If they escape into the wild, they could adversely affect wild mink and other wildlife, including threatened and endangered species, through hybridization, competition, and predation. If they become infected with the SARS-CoV-2 virus, farmed mink—whether escaped or in captivity—could transmit the virus to humans, wild mink, or other wildlife through direct interaction or through other vectors such as their carcasses, their fur, their feces, or contaminated water. For these reasons, we urge the USFWS to expeditiously respond to this petition by prohibiting the importation, transportation, and acquisition of any live or dead mink in trade, including parts containing fur.

Sincerely,

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