

Searching for Wildlife: A Critique of Canada's Regulatory Response to Emerging Zoonotic Diseases

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Canada lacks a coherent and effective regulatory framework to address emerging zoonotic diseases (pathogenic diseases with animal origins), as highlighted by experiences with SARS in 2003 and H1N1 in 2009. The author argues that because most emerging zoonotic diseases begin in wildlife populations, any attempt to address their root causes must take wildlife health into account; if wildlife are healthy, diseases are less likely to develop among them and spread to humans. She further argues that the various government departments and agencies responsible for the health of humans, domesticated animals and wildlife must adopt a formal, integrated approach to infectious disease management. Under the current regulatory scheme, there are gaps in disease surveillance, wildlife health concerns are not given due priority, risk assessment processes do not explicitly consider the impact of human action on wildlife health, and there is insufficient collaboration between government sectors. The federal and provincial governments must go beyond viewing wildlife as a consumptive resource, and must consider the indirect effects of human-induced environmental changes on wildlife health.

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Introduction

In July 2010, researchers studying black-tailed prairie dogs in Grasslands National Park in southwestern Saskatchewan were disturbed to come across a dead prairie dog.¹ Another group of researchers in the area reported that previously active colonies of prairie dogs were silent. Laboratory testing confirmed that the prairie dogs had died of *Yersinia pestis*, or sylvatic plague. Immediately, public health and national park officials warned people to avoid the areas frequented by prairie dogs and prohibited pets within park boundaries. Known as the “Black Death”, the sylvatic plague is believed to have killed 200 million people during

1. See Todd Shury, “Sylvatic Plague in Grasslands National Park”, *CCWHC News* (1 September 2010) online: Canadian Cooperative Wildlife Health Centre <<http://www.ccwhc.ca>>.

three documented epidemics.² As most Canadians have only heard of the plague in history books, they can be excused for thinking that the disease is of little concern today. In reality though, ten to twenty human cases of the disease occur each year in North America.³

Documented cases of human death from sylvatic plague in Canada demonstrate the risk posed by contact with infected wildlife. C.H. was a healthy, thirty-four-year-old mink farmer in Alberta.⁴ He fed his captive mink on ground squirrels that he hunted near his farm. The ground squirrels had been infected with sylvatic plague, and they transmitted the disease to C.H.'s mink. While pelting the mink, C.H. scratched himself with a knife. The small cut on his knuckle was enough to introduce the infection to C.H. that led to his death within just four days. C.H. reported a sudden onset of weakness and general malaise in the first forty-eight hours. His temperature rose to 105°F, his lymph nodes became sore and his muscles ached. Right before his death, he developed a slight cough. The cough was particularly alarming because in its pneumonic form, sylvatic plague can become a rapidly spreading, highly fatal epidemic.⁵

Canada's recent experiences with emerging zoonotic diseases (EZDs), such as SARS,⁶ BSE⁷ and H1N1 confirm that "animal diseases, most of them derived from wildlife, threaten human health and human economies as never before".⁸ To date, the Canadian government has only acted to address wildlife health when health issues threaten the consumptive use of wildlife, or after a disease has emerged from wildlife and is known to pose

2. See USDA National Wildlife Research Center, *Rodent Ecology and Plague in North America* by Gary W Witmer (2004) at para 3, online: University of Nebraska—Lincoln <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1395&context=icwdm_usdanwrc>, citing Peter W Gasper & Rowena P Watson, "Plague and Yersiniosis", 3d ed in Elizabeth S Williams & Ian K Barker, eds, *Infectious Diseases of Wild Mammals* (Ames, Iowa: Iowa State University Press, 2001) 331.

3. See Witmer, *supra* note 2 at para 3.

4. See RJ Gibbons & FA Humphreys, "Plague Surveys in Western Canada" (1941) 32:1 *Canadian Public Health Journal* 24 at 26.

5. See *ibid* at 27.

6. Severe Acute Respiratory Syndrome.

7. Bovine Spongiform Encephalopathy.

8. Canadian Cooperative Wildlife Health Centre, *Canada's National Wildlife Disease Strategy* (31 May 2004) at 19, online: Canadian Cooperative Wildlife Health Centre <http://www.ccwhc.ca/publications/Framework_for_NWDS_bilingual_on_web_200406.pdf> [CCWHC *Strategy*].

a risk to human health or to the economy. This limited response runs counter to the public's expectation that government will have learned from previous disease outbreaks and introduced dramatically improved ways to prevent, detect and respond to EZD threats.

Through a review of the Canadian regulatory and policy frameworks for infectious disease control and wildlife management, this paper identifies a number of systemic and structural problems that impair the government's ability to address EZD threats. Principally, two interrelated critiques emerge. First, Canada is ignoring the root cause of EZDs—wildlife health. The needs of wildlife are not taken into account in the existing regulatory framework unless there is considered to be a potential human impact. The government's limited response to these threats is a direct consequence of the human lens shaping regulatory and policy decisions.

Second, government has failed to adopt a formal, integrated approach to confront the risks of infectious diseases. The failure to integrate wildlife health strategies with animal⁹ and human health strategies in Canada leads to actions in one sector eroding efforts to control EZDs in others. Similarly, although both the federal and provincial governments have broad jurisdiction to address infectious diseases, nothing compels either level of government to cooperate with the other to address wildlife diseases. The lack of integration risks a duplication of efforts, but may also leave gaps in efforts undetected where each level of government presumes the other is acting. These gaps threaten to undermine Canada's ability to meet its international obligations regarding infectious diseases.

Moreover, where governments have acted in concert to respond to disease threats in wildlife, coordination has been reactive and structured around individual diseases on an ad hoc basis.¹⁰ As a result, the regulations needed to support the physical infrastructure for tracking wildlife diseases are not in place. Consequently, government has little capacity to reliably predict which diseases pose the greatest risk. Even if government wanted

9. The health of companion animals, and also domesticated animals, is almost entirely overlooked by the policy and regulatory framework for infectious diseases, and thus not discussed in this paper.

10. See generally Kumanan Wilson & Harvey Lazar, "Governance in Pandemics: Defining the Federal Government's Role in Public Health Emergencies" in Jacalyn Duffin & Jacalyn Sweetman, eds, *SARS in Context: Memory, History, Policy* (Montreal: McGill-Queen's University Press, 2006) 147 at 147-56.

to address the root causes of EZDs, any effort to prioritize responses to wildlife diseases would be based on woefully inadequate data.

A review of government's surveillance, research, priority setting and risk assessment activities reveals the accuracy of these two critiques. This review shows that integration between human, animal and wildlife health departments and the agencies that support them is required to tackle the root causes of EZDs.

This critique of the ability of Canadian government to respond to EZD threats will proceed as follows. Part I provides a background to EZD regulation by defining emerging zoonotic diseases and situating them in Canada. This background provides the appropriate context from which to assess the importance of including wildlife in Canada's regulatory framework for infectious disease control. Part II introduces existing public health and animal health regulations, and Part III reviews Canadian wildlife regulation. Part IV introduces two policy framework proposals: the Canadian Cooperative Wildlife Health Centre *Strategy* and the international *Strategic Framework*, which together serve as the basis of my two-pronged critique. Part IV goes on to present this critique through an analysis of Canada's relevant surveillance, research, priority setting and risk assessment activities. Part V concludes with a discussion of what meaningful integration in wildlife health management would entail.

I. Emerging Zoonotic Diseases

A. *What Is a Zoonotic Disease?*

The World Organization for Animal Health, the Office International des Epizooties (OIE), defines zoonosis in the *Terrestrial Animal Health Code, 2012*, as “any disease or infection which is naturally transmissible from animals to humans”,¹¹ and defines an emerging disease as follows:

11. World Organization for Animal Health, the Office International des Epizooties, *Terrestrial Animal Health Code* (2013) online: World Organisation for Animal Health <http://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/2010/glossaire.pdf> at x [OIE *Terrestrial Animal Health Code*]. While zoonosis alone is defined in the *Terrestrial Animal Health Code*, zoonosis is commonly interchanged with zoonotic disease by the OIE and other international organizations. As a result, the more accessible term, zoonotic disease, will be used throughout this paper. See e.g. World Organization for Animal Health, *Emerging and Re-emerging Zoonoses* by Bernard Vallat (4 November 2004)

[A] new infection resulting from the evolution or change of an existing pathogenic agent, a known infection spreading to a new geographic area or population, or a previously unrecognized pathogenic agent or disease diagnosed for the first time and which has a significant impact on animal or public health.¹²

Because the majority of diseases arise from known pathogens in the environment, a disease is said to “emerge” when it infects a new species or a different population.¹³ Emergence is, therefore, a two-step process: (1) the introduction of the pathogen to a new host; and (2) the pathogen’s spread through that new population.¹⁴ Up to seventy percent of zoonotic diseases that have emerged in the last fifty years, such as SARS, HIV/AIDS and the Ebola virus, are estimated to have originated in wildlife populations.¹⁵ This paper uses the term “wildlife” as distinct from “animal” to distinguish between non-domesticated and domesticated animals (including those commonly used for agriculture).

B. Causes of Zoonotic Disease

Although the emergence of a novel zoonotic disease is the result of many factors, human activity that disturbs or degrades ecosystems is a principal driver.¹⁶ Human activity can disturb the mechanisms that intact, healthy ecosystems rely on to resist the devastating impacts of novel pathogens.¹⁷ Human-induced drivers of EZDs can be divided into four overlapping categories: changes to the biophysical environment;

online: World Organisation for Animal Health <<http://www.oie.int/for-the-media/editorials/detail/article/emerging-and-re-emerging-zoonoses>>.

12. *Supra* note 11 at iii.

13. See World Health Organization, *Zoonoses and the Human-Animal-Ecosystems Interface* (2014) online: World Health Organization <<http://www.who.int/zoonoses/en>>. Zoonotic pathogens are incredibly diverse and can include bacteria (e.g., anthrax), parasites (e.g., viruses toxoplasmosis), viruses (e.g., rabies), fungi (e.g., dermatophytoses) and unconventional agents such as prions (variant Creutzfeldt-Jakob Disease). *Ibid.*

14. See SS Morse, “Factors and Determinants of Disease Emergence” (2004) 23:2 *Revue Scientifique et Technique* 443 at 444.

15. See CCWHC *Strategy*, *supra* note 8 at 18.

16. See Jonathan A Patz et al, “Human Health: Ecosystem Regulation of Infectious Diseases” in Rashid Hassan, Robert Scholes & Neville Ash, eds, *Ecosystems and Human Well-being: Current State and Trends*, vol 1 (Washington, DC: Millennium Ecosystem Assessment, 2005) 391 at 406 [Patz, “Human Health”].

17. See *ibid* at 393.

movement of populations and pathogens, including movement through trade; agriculture; and urbanization.¹⁸

(i) Changes to Biophysical Environment

Deforestation and resource extraction are examples of changes to the biophysical environment that can cause EZDs. When deforestation results in different land uses abutting one another it can produce “edge effects” that “promote interactions among pathogens, vectors, and hosts”.¹⁹ Edge effects bring people, animals and wildlife into more frequent contact, and have been linked to the emergence of hantavirus and plague, both of which are found in Canada.²⁰ Deforestation can also cause habitat fragmentation, which may disturb the balance between predators and prey that controls the spread of infectious diseases. The emergence of Lyme disease throughout North America has been tied to habitat fragmentation.²¹ For example, it has been shown that forest fragmentation can reduce the amount of vertebrate species available to prey on and compete with the white-footed mouse—a leading reservoir of Lyme bacteria. As a result, blacklegged ticks increasingly feed on these mice and spread Lyme disease.²²

Resource extraction and agriculture can release toxins into the environment that may suppress the immune systems of humans, animals and wildlife, thereby increasing their susceptibility to disease. This problem is amplified when such toxins are released into degraded environments that lack natural filtering and detoxification mechanisms,

18. See Jonathan A Patz et al, “Unhealthy Landscapes: Policy Recommendations on Land Use Change and Infectious Disease Emergence” (2004) 112:10 *Environmental Health Perspectives* 1092 at 1093 [Patz, “Unhealthy Landscapes”]. The following is a list of land-use activities that are known to have human health effects as compiled by leading environment health experts and presented in declining order of importance: agricultural development, urbanization, deforestation, population movement, increasing population, introduction of novel species/pathogens, water and air pollution, biodiversity loss, habitat fragmentation, animal-intensive systems, eutrophication, military conflict, monocropping and erosion. The experts then placed these activities into the four categories discussed. *Ibid.*

19. *Ibid.*

20. See Patz, “Human Health”, *supra* note 16 at 393.

21. See *ibid.*

22. See Brian F Allan, Felicia Keesing & Richard S Ostfeld, “Effects of Forest Fragmentation on Lyme Disease Risk” (2003) 17:1 *Conservation Biology* 267 at 270.

such as wetlands.²³ In addition, deforestation, mining, excavating and irrigation can all promote unnatural water collection points, creating ideal mosquito breeding conditions that increase the risk of diseases, such as West Nile virus.²⁴

(ii) Movement of Populations

The movement of human populations may also increase the risk of EZDs by increasing contact between humans, animals and wildlife by facilitating trade in, and consumption of, wildlife. For example, when new roads are built in previously inaccessible areas, hunting and trading wildlife become easier. Access can become problematic, as demonstrated by the suspected role of bushmeat in the emergence of HIV and the Ebola virus.²⁵ Similarly, monkeypox was introduced to the United States through the wildlife pet trade.²⁶ Likewise, zoonotic diseases can follow environmental refugees to new areas.²⁷ Whether forced to move due to acute environmental disasters such as floods or earthquakes, or as a result of long-term changes to their traditional homelands, migrants may carry novel pathogens with them.

Furthermore, EZDs can emerge when wildlife move into new areas. Wildlife are often forced into new areas because their traditional home ranges have been altered or degraded by human-induced land use changes. The discovery of the Nipah virus provides an excellent example of the consequences of wildlife translocation and disease emergence.²⁸

(iii) Agriculture

Besides the concerns associated with land clearing and developing new unnatural water collection points, agriculture can heighten EZD

23. See *ibid* at 395.

24. See Patz, "Unhealthy Landscapes", *supra* note 18 at 1093.

25. See Patz, "Human Health", *supra* note 16 at 407.

26. See United States Geological Survey, *Disease Emergence and Resurgence: The Wildlife-Human Connection* by Milton Friend (Virginia: 2006) at 177, online: US Geological Survey <<http://www.nwhc.usgs.gov>>.

27. See Patz, "Human Health", *supra* note 16 at 400.

28. See generally Kaw Bing Chua, "Nipah Virus Outbreak in Malaysia" (2003) 26:3 *Journal of Clinical Virology* 265; Asok Kurup, "From Bats to Pigs to Man: The Story of the Nipah Virus" (2002) 11:2 *Infectious Diseases in Clinical Practice* 52.

risks through irrigation and animal production practices.²⁹ Irrigation disrupts natural wet and dry cycles that help buffer disease threats.³⁰ Intensive animal production brings humans, livestock and wildlife into close proximity and has facilitated the emergence of diseases, including the Nipah virus, BSE, SARS and avian influenza.³¹ Antibiotic use in the agricultural sector contributes to increased microbial resistance in wildlife and humans, thereby reducing the options for effectively treating disease.³²

(iv) Urbanization

Finally, where sufficient infrastructure has not been in place to support urban population growth, EZD risks have increased.³³ Overcrowding and the lack of adequate sanitation facilities, although now more commonly associated with developing countries, remain a source of disease outbreaks.³⁴ As urban populations spill out into adjacent rural landscapes, edge effects intensify, and diseases such as Dengue fever can emerge.³⁵

C. Emerging Zoonotic Diseases in Canada

Two factors help explain why Canadians have largely escaped the most devastating impacts of EZDs to date. First, the large-scale transformation of the environment that resulted from colonial settlements triggered a corresponding increase of wealth in the Canadian settler population. Some scholars argue that a rise in socioeconomic status can improve an individual or community's capacity to respond to infectious diseases.³⁶

29. See Patz, "Unhealthy Landscapes", *supra* note 18 at 1094.

30. See Patz, "Human Health", *supra* note 16 at 399.

31. See *ibid* at 406.

32. See *ibid* at 408.

33. See *ibid* at 403–04.

34. See Peter Daszak, Andrew A Cunningham & Alex D Hyatt, "Emerging Infectious Diseases of Wildlife: Threats to Biodiversity and Human Health" (2000) 287:5452 *Science* 443 at 443.

35. See Patz, "Human Health", *supra* note 16 at 393.

36. See Diarmid Campbell-Lendrum et al, "Ecosystems and Vector-borne Disease Control" in Kanchan Chopra et al, eds, *Ecosystems and Human Well-Being: Policy Responses*, vol 3 (Washington, DC: Island Press, 2005) 353 at 359.

Better hygiene, sanitation,³⁷ housing,³⁸ nutrition,³⁹ and access to health care and health education⁴⁰ all reduce disease transmission rates. Second, Canada's climate has likely been the most effective barrier to transmission. Mosquitoes, ticks and fleas that spread many zoonotic diseases have often been unable to survive historic winter temperatures.⁴¹

Recent outbreaks of EZDs with wildlife origins and disease threats associated with the wildlife trade, however, highlight the increasing risks that Canada faces despite its climate. Canada's experience with highly pathogenic avian influenza (HPAI) in the poultry sector exemplifies the significant economic costs posed by EZDs. HPAI is highly infectious and deadly among poultry and related wild and domestic avian species.⁴² In 2004, Canada reported its first case of HPAI in poultry to the OIE.⁴³ This disease was first detected in the densely concentrated poultry sector of the Fraser Valley in British Columbia after suspected contact with infected wildlife, and moved quickly from barn to barn through human activity. To comply with international regulations on how best to control the spread of HPAI, the Canadian Food Inspection Agency (CFIA) adopted a strategy of "stamping out" (eradication), and ordered the depopulation of poultry barns that had been identified as having HPAI or were located within a control area where there was a risk of exposure. In the end, approximately seventeen million birds were slaughtered. The ninety-one day outbreak in 2004 is estimated to have cost the Canadian economy \$380 million.⁴⁴ Since then, HPAI and low pathogenic avian influenza have been detected on poultry farms in 2005 and 2009 in BC,⁴⁵ 2007 in

37. See *ibid* at 364.

38. See *ibid* at 359.

39. See *ibid* at 364.

40. See *ibid* at 364–65.

41. See Jonathan A Patz et al, "Global Climate Change and Emerging Infectious Diseases" (1996) 275:3 *The Journal of the American Medical Association* 217 at 217.

42. See Ilaria Capua & Dennis J Alexander, "Ecology, Epidemiology and Human Health Implications of Avian Influenza Virus Infections" in Ilaria Capua & Dennis J Alexander, eds, *Avian Influenza and Newcastle Disease: A Field and Laboratory Manual* (Milan: Springer-Verlag Italia, 2009) 1.

43. See J Pasick, Y Berhane & K Hooper-McGrevy, "Avian Influenza: The Canadian Experience" 28:1 *Scientific and Technical Review of the Office International des Epizooties* 349 at 350.

44. See *ibid* at 352.

45. See *ibid* at 353.

Saskatchewan,⁴⁶ and 2010 in Manitoba,⁴⁷ initiating a similar response from the CFIA and resulting in substantial economic losses.

Travel abroad further exacerbates the threat of EZDs. In 2003, a woman returned to Canada from a trip to Hong Kong after contracting SARS from another patron at a hotel where she stayed.⁴⁸ She returned to Toronto and died at home shortly thereafter, but not before her son became infected. He sought medical attention at a local hospital, where he infected visitors, patients and healthcare workers. Another Canadian who had stayed at the same hotel in Hong Kong brought SARS home with him to Vancouver.⁴⁹ In the end, forty-four people died and 438 probable and suspect SARS cases were identified in Canada.⁵⁰ The economic losses from the direct costs to Ontario's health system and the decline in tourism revenue have been estimated at nearly \$1.2 billion.⁵¹ The SARS outbreak illustrates how global travel permits a previously unknown disease to move from anywhere in the world to Canada in the time it takes for a plane to cross that distance.

The movement of infected humans and animals, however, is not the only source of EZDs in Canada. The global trade in wildlife and wildlife parts poses health threats to humans, animals, wildlife and ecosystems generally.⁵² Although there has been no research specific to Canada, studies of the trade of both legal and illegal wildlife into the US and France illustrate Canada's vulnerability.⁵³ Ebola virus, monkeypox,⁵⁴ amphibian

46. See *ibid* at 354.

47. See Canadian Food Inspection Agency, *Canadian Food Inspection Agency Final Report: Response to Findings of Highly Pathogenic Avian Influenza (H7N3) in Saskatchewan, September 2007* (Ottawa: Canadian Food Inspection Agency, 2010).

48. See Canada, National Advisory Committee on SARS and Public Health, *Learning from SARS: Renewal of Public Health in Canada* (Ottawa: Health Canada, 2003) at 26.

49. See *ibid*.

50. See *ibid* at 1.

51. See Michael T Osterholm, "Preparing for the Next Pandemic" (2005) 84:4 For Aff 24 at 28.

52. See Kristine M Smith et al, "Zoonotic Viruses Associated with Illegally Imported Wildlife Products" (2012) 7:1 PLoS ONE e29505 at 1, online: PLoS ONE <<http://plosone.org>> .

53. See e.g. Boris I Pavlin, Lisa M Schloegel & Peter Daszak, "Risk of Importing Zoonotic Diseases through Wildlife Trade, United States" (2009) 15:11 Emerging Infectious Diseases 1721. See generally Smith et al, *supra* note 52.

54. See Pavlin, Schloegel & Daszak, *supra* note 53 at 1721.

chytridiomycosis, and exotic Newcastle's disease are examples of diseases imported into the US through the wildlife trade.⁵⁵

The threat posed by the global wildlife trade is especially alarming given the scale of animals and animal parts that are traded illegally and thus without regulatory scrutiny. Accurate estimates of the extent of the illegal trade are difficult to make, although one study focused on African bushmeat provides a sense of the scope of the problem. From seizures of wildlife and wildlife parts on a sample of twenty-nine flights, one study estimated 273 tonnes of African bushmeat enter the Roissy-Charles de Gaulle airport on Air France flights alone per year.⁵⁶ Had it not been confiscated, this bushmeat would have been consumed without inspection. A study that tested confiscated shipments of illegally imported bushmeat in the US further illustrates the potential health threats. In twenty passenger-carried shipments and eight postal shipments, parts from "nonhuman primates (NHP) and rodent species, including baboon, chimpanzee, mangabey, guenon, green monkey, cane rat and rat" were identified.⁵⁷ From these limited samples, simian foamy virus⁵⁸ and two herpes viruses were identified.⁵⁹ There is nothing to suggest that Canada is any more protected than the US or France from EZDs accompanying imported wildlife and wildlife products.

Moreover, the effects of climate change mean that the historic protection offered by Canadian winters can no longer be relied upon. Consider Lyme disease. While habitat fragmentation has been identified as a leading cause of the emergence of Lyme disease in Canada, climate change has also played a critical role.⁶⁰ The first ticks carrying Lyme disease entered Canada in 1990 on migratory birds.⁶¹ Infected ticks are now found in areas where 18% of Canada's population resides, and

55. See Smith et al, *supra* note 52 at 1-2.

56. See Anne-Lise Chaber et al, "The Scale of Illegal Meat Importation from Africa to Europe via Paris" (2010) 3:5 Conservation Letters 317 at 318, 320.

57. Smith et al, *supra* note 52 at 1, 3.

58. See generally Public Health Agency of Canada, *Simian Foamy Virus (SFV): Questions and Answers* (2008) online: Public Health Agency of Canada <<http://www.phac-aspc.gc.ca>>.

59. See Smith et al, *supra* note 52 at 4.

60. See Patz, "Human Health", *supra* note 16 at 393.

61. See Muhammad G Morshed et al, "Migratory Songbirds Disperse Ticks Across Canada, and First Isolation of Lyme Disease Spirochete, *Borrelia Burgdorferi*, from Avian Tick, *Ixodes Auritulus*" (2005) 91:4 Journal of Parasitology 780 at 786.

that proportion is expected to increase to 80% by 2020, largely due to warming temperatures.⁶² Similarly, the rapid spread of West Nile virus across Canada by mosquitoes has also been attributed to climate change.⁶³

Many scientific studies have identified factors that help explain why we are facing increased threats of EZDs originating from wildlife.⁶⁴ Almost without exception, these studies conclude with a call for governments to respond to the threat by incorporating wildlife health into existing regulatory frameworks. Canadian regulators have not escaped these calls.⁶⁵

II. Existing Regulation of Emerging Zoonotic Diseases

That federal and provincial governments have the jurisdiction to address EZDs is not controversial, but it is not readily apparent who will intervene, if at all, because no unified regulatory framework for responding to EZDs is in place in Canada. The fact that EZDs infect both humans and animals has resulted in the lack of a holistic approach to their regulation. Infectious diseases that threaten humans are regulated through the public health regime, and those that threaten animals are regulated through the animal health regime. To understand how EZDs with wildlife origins may be regulated, it is necessary to consider existing public health and animal health regulations. Where governments have intervened to address a health issue in wildlife, they have typically relied on animal health regulations. In addition, depending on the severity⁶⁶ of the disease threat, government emergency powers may be relevant.

62. See Patrick A Leighton et al, "Predicting the Speed of Tick Invasion: An Empirical Model of Range Expansion for the Lyme Disease Vector *Ixodes Scapularis* in Canada" (2012) 49:2 *Journal of Applied Ecology* 457 at 457.

63. See Dominique Charron et al, "Zoonoses: Climate Change Affects the Modes by Which Diseases Are Passed From Animals to Humans" (2005) 31:3 *Alt J* 24 at 25.

64. See e.g. Louise Swift et al, "Wildlife Trade and the Emergence of Infectious Diseases" (2007) 4:1 *EcoHealth* 25; Morse, *supra* note 14.

65. See Part IV, below, for further discussion.

66. In this context, "severity" will generally refer to the gravity of harm to human health posed by the zoonotic disease, and not the harm to the economy, or animal and wildlife health. That being said, the government's emergency powers may also be relevant when an animal disease targeted at the agricultural sector is introduced. These types of threats

A. Animal Health Regulations

To begin, the federal *Health of Animals Act (HAA)*⁶⁷ imposes immediate reporting obligations on anyone, including a non-owner, who is in control of any animal known or suspected to have a reportable disease.⁶⁸ The Minister of Agriculture and Agri-Food has broad discretion to prescribe reportable diseases, for which the *HAA* sets out no criteria.⁶⁹ Among those that are reportable are zoonotic diseases such as HPAI, Rift Valley fever, rabies and anthrax. Two subtypes of low pathogenic avian influenza were recently added to the list due to their recognized pandemic potential.⁷⁰ In addition, the *Health of Animals Regulations* requires diagnostic laboratories to report two further categories of diseases: immediately notifiable diseases and annually notifiable diseases.⁷¹ Together, these reporting obligations are typically the initial trigger for federal action in response to animal health crises in Canada.

The definition of disease found in the *HAA* removes any doubt that the Minister of Agriculture and Agri-Food has broad authority to respond to zoonotic diseases beyond those on any of the prescribed disease lists. The *HAA* defines “disease” as including “any other disease that may affect an animal or that may be transmitted by an animal to a person”,⁷² and the *HAA*’s definition of “animal” does not exclude wildlife.⁷³ The Act gives the Minister the authority to inspect,⁷⁴ quarantine, and destroy⁷⁵ wildlife that pose a health threat to humans, as well as wide discretion to regulate

are regularly identified as possible bioterrorism threats, and if they materialize they may be considered severe.

67. SC 1990, c 21.

68. *Ibid.*, s 5. For a comprehensive discussion of animal health regulations, see Agriculture and Agri-Food Canada, *Report on the Legal Framework for Animal Health* by Patricia L Farnese & Barbara von Tigerstrom (Ottawa: Agriculture and Agri-Food Canada, 2009) online: Government of Canada Publications <http://publications.gc.ca/collections/collection_2013/aac-aafc/A34-20-2013-eng.pdf>.

69. *Supra* note 67, s 2(2).

70. *Reportable Diseases Regulations*, SOR/91-2, Schedule.

71. CRC, c 296, ss 91.2(1), 91.2(3) (the diseases designated as immediately notifiable and annually notifiable can be found in schedules VII and VIII of these regulations).

72. *Supra* note 67, s 2(1).

73. *Ibid.*

74. *Health of Animals Regulations*, *supra* note 71, s 4.

75. *Ibid.*, s 5.

the import of animals that may be diseased.⁷⁶ As a result, the federal government can act to prevent the introduction of EZDs into Canada through regulating both the legal and illegal trade of wildlife.⁷⁷

Provincial animal health legislation also lists mandatory reportable diseases.⁷⁸ The list varies with each province, and generally reflects the specific animal health concerns of that province. For example, infectious laryngotracheitis and *Mycoplasma gallisepticum* of turkeys are classified as immediately notifiable under BC's *Animal Disease Control Act*,⁷⁹ yet are absent from federal reporting requirements. Like their federal counterparts, provincial ministers responsible for animal health have the authority to investigate disease threats and take action in response, including ordering the quarantine and the testing and destruction of animals.⁸⁰ Whether a province can rely on animal health legislation to respond to an EZD in wildlife, in the absence of a clear link to animal health, depends on the particular definition of "animal" in the province's legislation. British Columbia, New Brunswick, Nova Scotia and Prince Edward Island now define "animal" in such a way as to limit the application of their animal health legislation to animals involved in fur production or agriculture.⁸¹

76. *Health of Animals Act*, *supra* note 67, s 14.

77. Health Canada manages the regulatory process for approving veterinary drugs, thereby playing an essential role in responses to animal diseases. Veterinary drugs, however, are rarely viewed as a viable treatment option for wildlife.

78. See *Health Protection and Promotion Act*, RSO 1990, c H.7; *Emergency Management and Civil Protection Act*, RSO 1990, c E-9 (Ontario regulates response to animal health concerns through a variety of statutes). Compare *Animal Disease Control Act*, RSBC 1996, c 14; *Livestock Diseases Act*, RSA 2000, c L-15; *Animal Health Act*, SA 2007, c A-40.2; *The Diseases of Animals Act*, RSS 1978, c D-30; *The Animal Diseases Act*, CCSM c A85; *Animal Health Protection Act*, RSQ c P-42; *Animal Health and Protection Act*, RSNS 1989, c 15 [*Animal Act Nova Scotia*]; *Diseases of Animals Act*, RSNB 2011, c 142; *Animal Health and Protection Act*, RSPEI 1988, c A-11.1 [*Animal Act PEI*]; *Livestock Health Act*, RSNL 1990, c L-22.

79. *Supra* note 78, s 1.

80. See e.g. *Animal Health and Protection Regulations*, NS Reg 82/87, ss 8(i), 8(n); *Animal Disease Control Act*, *supra* note 78, s 8.

81. See *Animal Disease Control Regulation*, BC Reg 4/2010, s 1.01(2); *Diseases of Animals Act*, *supra* note 78, s 1; *Animal Act Nova Scotia*, *supra* note 78, s 2(a); *Animal Act PEI*, *supra* note 78, s 1(a).

B. Public Health Regulations

In the public health realm, infectious disease control is a key mandate of the Public Health Agency of Canada (PHAC), and specifically its Infectious Disease Prevention and its Control and Health Security Infrastructure branches.⁸² PHAC's infectious disease control activities include conducting disease surveillance and developing reporting requirements for listed diseases. The *Quarantine Act* contains regulations aimed at screening and detaining individuals or goods suspected of carrying an infectious disease.⁸³ In addition, Health Canada can act to prevent the spread of infectious diseases.⁸⁴

Regulating health also falls within provincial and territorial jurisdiction. In most cases, a province or territory will be the first to respond to a public health crisis because individuals will seek medical attention at the local level. Each province and territory has legislation comparable to the federal legislation, which contains reporting requirements for listed infectious diseases.⁸⁵ Typically the federal government will only

82. Public Health Agency of Canada, *Current List of Nationally Notifiable Diseases and Years of Notifiable* (2013) online: Public Health Agency of Canada <<http://phac-aspc.gc.ca>> .

83. SC 2005, c 20, ss 12–17, 34.

84. See Public Health Agency of Canada, *About the Agency* (2014) online: Public Health Agency of Canada <<http://www.phac-aspc.gc.ca/index-eng.php>> ; *Public Health Agency of Canada Act*, SC 2006, c 5. The Public Health Agency of Canada is a relatively new organization of the federal government. As such, its organizational structure continues to evolve. Currently, the Infectious Diseases Prevention and Control Branch houses the National Microbiology Laboratory, the Laboratory for Foodborne Zoonoses, the Centre for Immunization and Respiratory Infectious Diseases, the Centre for Communicable Diseases and Infection Control, and the Centre for Foodborne Environmental and Zoonotic Infectious Diseases. The Health Security Infrastructure Branch oversees the Centre for Biosecurity, the Centre for Emergency Preparedness and Response, the Centre for Public Health Capacity and the Centre for Surveillance Strategy and Data Management. Depending on the nature of the EZD, any of these entities may become engaged in preventing, identifying and/or responding to the disease threat. See Public Health Agency of Canada, *Organizational Chart* (2013) online: Public Health Agency of Canada <<http://www.phac-aspc.gc.ca>> .

85. See *Public Health Act*, SBC 2008, c 28 [*Public Health Act* British Columbia]; *Public Health Act*, RSA 2000 [*Public Health Act* Alberta], c P-37; *The Public Health Act, 1994*, SS 1994, c P-37.1; *The Public Health Act*, CCSM 2006, c P210 [*The Public Health Act* Manitoba]; *Health Protection and Promotion Act*, *supra* note 78; *Public Health Act*, CQLR c S-2.2 [*Public*

become involved when a disease outbreak risks crossing borders, be they provincial, territorial or international, or poses a threat beyond a province or territory's ability to effectively respond.

Provincial and territorial public health statutes grant ministers of health expansive powers to protect public health or respond in times of emergency. For example, in Ontario the Minister may act to address a "health hazard", which the provincial statute defines as including an animal "that has or that is likely to have an adverse effect on the health of any person".⁸⁶ The Act does not define "animal", so it would appear to authorize government action to respond to EZDs in wildlife. Powers to investigate, confiscate, quarantine, compel testing and treatments, and destroy goods—including animals—are also common in provincial public health statutes.⁸⁷

Finally, infectious disease outbreaks exceeding the scale of the 2009 H1N1 pandemic or the 2003 SARS outbreak may warrant the use of emergency powers at both levels of government. These powers allow governments to access additional resources and to compel individuals to provide goods and services in support of an effective response to an emergency. Both the provinces and the federal government have regulated

Health Act Quebec]; *Health Protection Act*, SNS 2004, c 4 [*Health Protection Act* Nova Scotia]; *Public Health Act*, SNB 1998, c P-22.4 [*Public Health Act* New Brunswick]; *Health and Community Services Act*, SNL 1995, c P-37.1; *Public Health Act*, RSPEI 1988, c P-30.1 [*Public Health Act* PEI]; *Public Health Act*, SNWT 2007, c 17 [*Public Health Act* Northwest Territories]; *Public Health and Safety Act*, RSY 2002, c 176.

86. *Health Protection and Promotion Act*, *supra* note 78, s 1. The language used in other jurisdictions can similarly be interpreted to provide scope for provincial action to address EZDs in wildlife. See *Public Health Act* British Columbia, *supra* note 85, s 1 (definition of "health hazard"); *Public Health Act* Alberta, *supra* note 85, s 1 (definition of "communicable disease"); *The Public Health Act, 1994*, *supra* note 85, s 2 (definition of "communicable disease"); *The Public Health Act* Manitoba, *supra* note 85, s 1 (definition of "health hazard"); *Public Health Act* Quebec, *supra* note 85, ss 92–93; *Health Protection Act* Nova Scotia, *supra* note 85, s 3 (definition of "health hazard"); *Public Health Act* New Brunswick, *supra* note 85, s 1 (definition of "health hazard"); *Health and Community Services Act*, *supra* note 85, s 11; *Public Health Act* PEI, *supra* note 85, s 1 (definition of "communicable disease"); *Public Health Act* Northwest Territories, *supra* note 85, s 1 (definition of "communicable disease"); *Public Health and Safety Act*, *supra* note 85, s 2.

87. See e.g. *Health Protection Act* Nova Scotia, *supra* note 85, ss 32, 53; *Health Protection and Promotion Act*, *supra* note 78, ss 22, 41; *Public Health Act* Alberta, *supra* note 85, ss 29–52; *The Public Health Act, 1994*, *supra* note 85, ss 38, 45.

the use of emergency powers.⁸⁸ Some provincial public health statutes explicitly provide for emergency powers during a public health crisis.⁸⁹ In other cases, definitions in emergency legislation of what constitutes an emergency are likely broad enough to encompass public health crises.⁹⁰

III. Wildlife Regulation

A. Overview

Remarkably similar regulations addressing wildlife⁹¹ management exist in all provinces and territories.⁹² Provincial jurisdiction over wildlife is grounded in the provinces' constitutionally recognized authority to regulate lands and resources, and wildlife management typically falls within the mandate of departments of natural resources or the environment. Consistent with the common law, provincial legislation designates all wildlife as property of the Crown.⁹³

Nonetheless, federal wildlife regulations also exist.⁹⁴ For the most part, the federal government has enacted these regulations in response to Canada's international obligations to protect wildlife from overexploitation and address biodiversity loss. The federal government, however, can justify

88. See e.g. *Emergencies Act*, RSC 1985, c 22 (4th Supp); *Emergency Management Act*, SNS 1990, c 8.

89. See e.g. *Public Health Act* British Columbia, *supra* note 85, Part 5.

90. See e.g. *The Public Health Act* Manitoba, *supra* note 85.

91. The definition of "wildlife" contained in provincial legislation generally limits the term to non-domesticated, native species of animals. While some jurisdictions have regulations to deal with captive wildlife that may apply to imported or domestically bred exotic wildlife, such as tigers, monkeys and elephants, the regulation of infectious disease risks of exotic wildlife is not discussed in this paper. Likewise, fish and marine mammals are generally subject to separate regulatory regimes, and thus are not discussed in this paper.

92. See *Wildlife Act*, RSBC 1996, c 488 [*Wildlife Act* British Columbia]; *Wildlife Act*, RSA 2000, c W-10 [*Wildlife Act* Alberta]; *The Wildlife Act*, CCSM c W130; *Fish and Wildlife Conservation Act, 1997*, SO 1997, c 41; *An Act Respecting the Conservation and Development of Wildlife*, CQLR c C-61.1; *Fish and Wildlife Act*, SNB 1980, c F-14.1; *Wildlife Act*, RSNS 1989, c 504; *Wildlife Conservation Act*, RSPEI 1988, c W-4.1; *Wild Life Act*, RSNL 1990, c W-8; *Wildlife Act*, RSY 2002, c 229; *Wildlife Act*, RSNWT 1988, c W-4; *Wildlife Act*, SNU 2003, c 26; *The Wildlife Act, 1998*, SS 1998, c W-13.12 [*The Wildlife Act* Saskatchewan].

93. See e.g. *ibid*, s 23.

94. See *Canada Wildlife Act*, RSC 1985, c W-9, s 12.

regulating wildlife in accordance with the trans-boundary nature of wildlife and the recognized federal jurisdiction to regulate trans-boundary environmental matters.⁹⁵ Territorial governments' authority to regulate wildlife is a delegation of the federal government's jurisdiction over federal lands. Likewise, the federal government can enforce regulations in national parks that have a wildlife management objective.⁹⁶ A review of the objectives and content of both provincial⁹⁷ and federal wildlife regulations, however, reveals that addressing EZDs with wildlife origins is almost entirely absent from the regulatory framework for wildlife management.⁹⁸

B. Provincial Regulation

Because property in wildlife is vested in the provincial Crown, provincial regulatory frameworks for wildlife management are primarily concerned with the establishment and operation of licencing schemes that allow individuals to acquire property rights in wildlife through hunting and trapping.⁹⁹ These licencing schemes reflect the treatment of wildlife as a resource available for exploitation, but in need of management to ensure continued supply. Provincial regulations also contain mechanisms that allow landowners to deal with problem or nuisance wildlife that are harming personal property (typically domestic livestock) without running afoul of prohibitions against hunting or trapping without a licence.¹⁰⁰ Finally, jurisdictions that allow raising wildlife in captivity—for example, on game or fur farms—have enacted targeted regulations, including some related to health.¹⁰¹

95. See *R v Crown Zellerbach Canada Ltd*, [1988] 1 SCR 401, 49 DLR (4th) 161.

96. See *Canada National Parks Act*, SC 2000, c 32, s 16.

97. Because territorial wildlife regulations mirror the provincial regulatory and policy framework discussed below, they will not be discussed separately.

98. For the purpose of this paper, an extensive discussion of the content of wildlife regulations is unnecessary. Detailed discussions of Canadian wildlife regulation can be found in Lesli Bisgould, *Animals and the Law* (Toronto: Irwin Law, 2011); John Donihee, *The Evolution of Wildlife Law in Canada* (Calgary: Canadian Institute of Resources Law, 2000).

99. See e.g. *Wildlife Act* British Columbia, *supra* note 92, ss 2, 11.

100. See e.g. *Fish and Wildlife Act*, *supra* note 92, s 34(4).

101. See e.g. *The Domestic Game Farm Animal Regulations*, RRS, c A-20.2, Reg 10, OC 339/1999; *Fur Farm Regulation*, BC Reg 310/59.

Over time, the provinces have expanded their wildlife regulations to encompass habitat protection. Regulation of this sort is similar across the provinces. The earliest habitat protection efforts established wildlife reserves where hunting and trapping, as well as most other activities that threatened wildlife habitat, were prohibited.¹⁰² Later, regulations normally applicable on private land have targeted the habitat of endangered species. They adopt a restricted view of habitat, prohibiting only the destruction or degradation of the nests, dens or other homes of an endangered species.¹⁰³

Some provinces have also expanded their wildlife legislation to allow interventions to correct perceived imbalances in wildlife populations, typically between predators and prey. Targeted species have generally included those at risk of extinction and those used for consumption. However, provincial regulation has also responded at times to the overpopulation of nuisance wildlife.¹⁰⁴ Rewards to encourage private actors to engage in culling, increasing hunting and trapping permits or enabling government action to cull are the usual means employed by provinces to address wildlife population numbers. In some cases, extirpation of a species has been the goal. In recent times, extirpation has only targeted species that, while not technically native, have established widespread ranges in Canada since their introduction. Perhaps the best-known example is Alberta's efforts to remain "rat free".¹⁰⁵

Finally, although it is not a part of provincial wildlife acts, provincial environmental impact assessment legislation operates as part of the larger regulatory framework for wildlife. Such legislation typically requires the province to consider the impact of development decisions on wildlife habitats, including ranges.¹⁰⁶

102. See *The Wildlife Habitat Protection Act*, SS 1983–84, c W-13.2.

103. See *The Endangered Species Act*, CCSM c E111, s 10(1).

104. Such efforts are controversial, especially in urban populations. See Zoe McKnight, "Cull of the wild: Controlling animal populations across Canada", *National Post* (6 August 2010) online: National Post <<http://www.nationalpost.com>> .

105. See generally Alberta Agriculture, Food and Rural Development, *The History of Rat Control in Alberta* by John Bourne (1 October 2002) online: Alberta Agriculture, Food and Rural Development <<http://www.agriculture.alberta.ca>> .

106. See e.g. *Environmental Protection and Enhancement Act*, RSA 2000, c E-12, s 49(c).

C. Federal Regulation

As mentioned, the federal regulatory framework for wildlife is designed around international obligations to protect wildlife from over exploitation and address biodiversity loss. Principal among these are the *Convention Between the United States and Great Britain for the Protection of Migratory Birds*¹⁰⁷ and the *Convention on the International Trade in Endangered Species of Wild Fauna and Flora*.¹⁰⁸ Legislation has been enacted to implement both conventions. The *Migratory Bird Convention Act, 1994 (MBCA)* removes the listed migratory birds from provincial jurisdiction, although its objectives continue to mirror provincial wildlife acts.¹⁰⁹ The *MBCA* creates an obligation on the federal government to protect waterfowl habitat and imposes a licencing regime for hunting listed migratory birds,¹¹⁰ which typically are those with a historic or contemporary consumptive use.¹¹¹

Canada's obligations under the *Convention on the International Trade in Endangered Species of Wild Fauna and Flora* are primarily implemented through the *Species at Risk Act (SARA)*¹¹² and the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (WAPPRIITA)*.¹¹³ The *SARA* creates the offence for interfering with the habitat of endangered and threatened species.¹¹⁴ As its name suggests, the *WAPPRIITA* establishes a licencing regime to regulate both the export and import of listed wildlife species, and their parts and derivatives. It is the principal way Canada seeks to prevent the illegal trade in wildlife and wildlife parts, and the introduction of non-native species into the country.

107. 16 August 1916, 39 US Stat 1702, UKTS 1917 No 7.

108. 3 March 1973, 993 UNTS 243, Can TS 1975 No 32.

109. SC 1994, c 22.

110. See *Migratory Bird Regulations*, CRC c 1035, s 5(1).

111. See Environment Canada, *Migratory Birds Convention Act and Regulations: List of Migratory Birds—Taxonomic Order* (2012) online: Environment Canada <<http://www.ec.gc.ca>>.

112. SC 2002, c 29.

113. SC 1992, c 52.

114. *Supra* note 112, s 33.

Together, the *MBCA*, the *SARA* and the *WAPPRIITA* also support Canada's other international commitments to wildlife conservation.¹¹⁵

Concerns about infectious disease have had the most influence on federal wildlife regulations and have led to restrictions on the import and export of wildlife and their parts. Under *WAPPRIITA* and general border control regulations, border control officers have the authority to search and confiscate wildlife and wildlife parts that may pose disease threats.¹¹⁶ In addition, under *WAPPRIITA*, Environment Canada and its provincial and territorial counterparts may issue licences and permits to control the movement of wildlife across borders.¹¹⁷ Although the details of each system of licences and permits are different, they all have similar objectives. First, import and export regulations are an extension of hunting, fishing and trapping rules—only legally acquired wildlife may be exported. Second, many jurisdictions have regulations on the export of threatened or endangered wildlife. Third, and most relevant to wildlife health, are regulations that restrict the import and sale of specific wildlife species that are known to carry diseases that may infect indigenous wildlife, animals or humans. For example, Saskatchewan regulates the import of deer and elk out of concern for the spread of chronic wasting

115. See *Convention on Biological Diversity*, 5 June 1992, 31 ILM 818; *Convention on Wetlands of International Importance Especially as Waterfowl Habitat*, 2 February 1971, 996 UNTS 245, TIAS No 11084 (entered into force 21 December 1975, amended 1982 & 1987) [*Convention on Wetlands*]; Organization of American States, *Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere*, OR OEA/Ser.A/74a(SEPF) (1940) at 7; North American Waterfowl Management Plan, *2004 Strategic Guidance: Strengthening the Biological Foundation* (2004) online: North American Waterfowl Management Plan <<http://www.fws.gov/birdhabitat/nawmp/files/nawmp2004.pdf>>; TD Rich et al, *North American Landbird Conservation Plan* (Ithaca, NY: Cornell Lab of Ornithology, 2004) online: Partners in Flight <http://www.partnersinflight.org/cont_plan/PIF2_Part1WEB.pdf>; Waterbird Conservation for the Americas, *Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan* by James A Kushlan et al (2002) online: Waterbird Conservation for the Americas <http://www.pwrc.usgs.gov/nacwcp/pdfs/plan_files/introduction.pdf>.

116. *Supra* note 113, ss 13–14.

117. See e.g. *The Wildlife Regulations*, Sask Reg W-13.1 Reg 1/1981, ss 51–54.

disease¹¹⁸ and Nova Scotia restricts the sale of all snapping turtles out of concern for *Salmonella*.¹¹⁹

Finally, one cannot overstate the contribution Canada's network of national parks, and the lessons learned from their ongoing management, have made to the federal regulatory framework for wildlife. In addition to protecting a variety of wildlife habitats and wildlife species, the *Canada National Parks Act*¹²⁰ and its predecessor statutes have embodied key protections for endangered species.¹²¹ Lessons learned from managing wildlife in national parks have influenced wildlife management practices across the country.

This brief overview illustrates that the regulation of wildlife in Canada continues to be primarily concerned with the consumptive uses of wildlife, including hunting, trapping and fishing. Wildlife regulation has expanded in recent years to address the role of habitat in protecting threatened and endangered species. Almost no regulations exist, however, that address wildlife health, despite the obvious consequences of failing to do so for human health, the environment and the economy.

IV. Critique of the Existing Regulatory Framework

A. The Canadian Cooperative Wildlife Health Centre and Wildlife Diseases

The Canadian Cooperative Wildlife Health Centre (CCWHC)¹²² partially fills the notable gap in the regulation of wildlife health. In recognition of the need for wildlife disease surveillance and diagnostics,

118. See Saskatchewan Agriculture, Food and Rural Revitalization, *General Protocols for Importing Game Farm Animals into Saskatchewan: Protocol for the Importation of Game Farm Animals From Canada and the United States into the Province of Saskatchewan* (Regina: Saskatchewan Agriculture, Food and Rural Revitalization, 2004) at 11, online: Government of Saskatchewan, Agriculture <<http://www.agriculture.gov.sk.ca>> .

119. See *General Wildlife Regulations*, NS Reg 205/1987, s 9(1)(a).

120. *Supra* note 96.

121. See Janet Foster, *Working for Wildlife: The Beginning of Preservation in Canada*, 2d ed (Toronto: University of Toronto Press, 1998) at 104.

122. Canadian Cooperative Wildlife Health Centre, *Canadian Cooperative Wildlife Health Centre* (2014) online: Canadian Cooperative Wildlife Health Centre <<http://www.ccwhc.ca>> [CCWHC].

Environment Canada and the Canadian Wildlife Directors Committee established the CCWHC in 1992. The CCWHC was established to connect the diagnostic expertise found in Canada's five veterinary colleges¹²³ with the wildlife managers on the ground who are most likely to come in contact with diseased wildlife. Since the inception of the CCWHC, its staff and collaborators have played an essential role in diagnosing every novel wildlife disease outbreak in Canada.

Early in its history, the CCWHC recognized that it could fulfill more than a passive disease surveillance and reactive diagnostic role. In 2004, after broad consultation with all government agencies interested in wildlife health and with experts at the Canadian veterinary colleges, the CCWHC released *Canada's National Wildlife Disease Strategy (Strategy)*.¹²⁴ The *Strategy* proposed a comprehensive policy framework through which governments could cooperatively address the wildlife health objectives outlined in it. Six objectives were set out: prevention of emerging wildlife diseases; early detection of new diseases; rapid response to new diseases; effective disease management; education and training of wildlife specialists; and communication to further the coordination and collaboration necessary to attain the other goals.

B. Inadequate Framework and Calls for Reform

Unfortunately, the federal and provincial governments have not fully implemented the Canadian Cooperative Wildlife Health Centre's *Strategy*. Each of its six objectives was to have an action plan with immediate, medium-term and long-term goals to be implemented through the relevant government agencies.¹²⁵ Instead, the CCWHC has primarily continued its passive surveillance and reactive diagnostic activities, although it has undertaken a limited number of targeted projects aimed at addressing specific wildlife diseases known to threaten human health or the economy, such as avian influenza and chronic wasting disease.¹²⁶

Although the CCWHC's contribution to wildlife health is significant, by its own admission the incomplete implementation of the *Strategy* is

123. At the time of CCWHC's founding, there were only four veterinary colleges in Canada.

124. CCWHC *Strategy*, *supra* note 8 at 3.

125. *Ibid* at 1.

126. See generally CCWHC, *supra* note 122.

not sufficient to address the root causes of EZDs. There is increasing realization of the need for regulators to address wildlife diseases. The 2008 Report of the Auditor General of Canada on the Surveillance of Infectious Diseases, for example, explicitly recommended increased collaboration in wildlife surveillance between the Public Health Agency of Canada and the Canadian Food Inspection Agency due to the concern “that federal organizations may not be tracking animal diseases capable of affecting human health in the right places at the right times”.¹²⁷

Similarly, in 2008, the OIE, the Food and Agriculture Organization of the United Nations, the World Health Organization (WHO) and the World Bank released strategic framework, *Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface (Strategic Framework)*, that calls for the development of a preventative approach to “diminish the threat and minimize the global impact of diseases of animal origin, including zoonoses and those with pandemic potential”.¹²⁸ It outlined “significant strategic shifts” that must to occur in regulatory responses to infectious disease threats, including these:

- initiating more preventive action by dealing with the root causes and drivers of infectious diseases, particularly at the animal-human-ecosystems interface;
- strengthening national and international emergency response capabilities to prevent and control disease outbreaks before they develop into regional and international crises;
- promoting wide-ranging institutional collaboration across sectors and disciplines; and
- conducting strategic research to enable targeted disease control programs.¹²⁹

127. Office of the Auditor General, *Report of the Auditor General of Canada to the House of Commons: Chapter 5—Surveillance of Infectious Disease*, ch 5 (Ottawa: Minister of Public Works and Government Services Canada, 2008) at 12, online: Office of the Auditor General of Canada <http://www.oag-bvg.gc.ca/internet/docs/aud_ch_oag_200805_05_e.pdf>.

128. Food and Agriculture Organization of the United Nations et al, *Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface* (14 October 2008) at 18, online: Food and Agriculture Organization of the United Nations <<http://www.undg.org/docs/10051/contributing-to-one-world-one-health.pdf>>.

129. *Ibid.*

The *Strategic Framework* put forward by the OIE and the other international bodies mirrors the CCWHC's *Strategy* in suggesting regulatory changes that allow regulators to respond to the root causes of zoonotic diseases.

C. Critique in the Canadian Context

The current public and animal health regimes in Canada are structured around known diseases and therefore lack the necessary integration to deal effectively with EZDs. This lack of integration runs counter to the CCWHC's *Strategy* and the international *Strategic Framework's* call to break down the regulatory silos of animal health, human health and wildlife health. Consequently, it may be some time before an EZD garners a regulatory response, particularly if the disease first appears in wildlife. A regulatory framework that mandates collaboration, as recommended by the *Strategy* and *Strategic Framework*, is more likely to avoid gaps in disease surveillance, to establish cross-sector priorities and to adopt preventive strategies that address the root causes of EZDs.

Given the collective knowledge and experience of the participants involved in the creation of both the *Strategy* and the *Strategic Framework*, their goals provide a useful matrix to help identify the inadequacies of the existing regulatory framework in Canada because they represent a global consensus on what is needed to adequately respond to EZDs. In particular, two interrelated critiques emerge. First, the federal and provincial governments have failed to adopt a formal, integrated approach to confront the risks of infectious diseases, and as a result wildlife remains largely excluded from formal assessment and response mechanisms. Second, because of this exclusion, Canada's infectious disease regulations ignore the root causes of EZDs. The cogency of these critiques can be confirmed by reviewing the relevant surveillance, research, priority setting and risk assessment activities of the federal and provincial governments.

(i) Surveillance

The federal government relies primarily on passive surveillance to meet its international obligations to report disease threats and incidents. As described above, the regulatory scheme requires those at the local

level, who are most likely to come into contact with a listed disease, to report suspicious and confirmed cases. Thus, it is very important that mechanisms are in place to ensure that timely and accurate information about zoonotic diseases that may begin to appear in humans is shared with the appropriate animal health counterparts and that animal health counterparts similarly share information with the health authorities. Likewise, there must be a mechanism to ensure that information is quickly and accurately shared with the authority designated to report Canadian disease events internationally. As the national focal points for the OIE and the WHO are two different Canadian agencies, the CFIA and PHAC respectively, there is a risk that Canada will fail to meet its reporting obligations if efficient communication protocols do not exist.¹³⁰ The appointment of a CFIA liaison to PHAC's Emergency Operations Centre to deal with the 2009 H1N1 outbreak was an encouraging step towards formal integration of regulatory responses to zoonotic disease control.¹³¹

Nonetheless, a greater risk posed by the failure to have an integrated framework for infectious diseases lies in the possibility that Canada will fail to report on a timely basis and adequately respond to previously undetected or novel EZDs that do not appear on the current list of notifiable or reportable diseases.¹³² The possibility of failing to report and ultimately control a zoonotic disease before it becomes a regional or global crisis is higher when the EZD first appears in wildlife. Canada relies almost entirely on an underdeveloped, underfunded and passive surveillance system for diseases in wildlife. Further, the infrastructure to detect, diagnose and report such disease in wildlife is nowhere near as extensive as that found in health systems for humans and domesticated animals. Currently, new wildlife diseases are only identified if a member of the public, a wildlife officer or a researcher comes across a diseased

130. See Public Health Agency of Canada, *Canadian Stakeholder Comments on the January 12, 2004 Working Paper on the Revised International Health Regulations* (18 February 2005) online: Public Health Agency of Canada <<http://www.publichealth.gc.ca>>.

131. See Canadian Food Inspection Agency, *Pandemic H1N1 2009 Pig Farm Outbreak: CFIA Lessons Learned* (1 March 2011) online: Canadian Food Inspection Agency <<http://www.inspection.gc.ca>>.

132. Canada is subject to binding reporting obligations. See OIE *Terrestrial Animal Health Code*, *supra* note 11, article 1.1.3(1); World Health Organization, *International Health Regulations (2005)*, 2d ed (Geneva: World Health Organization Press, 2008), ss 12, 43-46.

or dead animal and brings that animal to the CCWHC's attention. The value of such passive disease surveillance is inherently limited.

Relying on the public to report wildlife disease no doubt means that large die-offs are more likely to be detected than mild disease symptoms or behavioural changes in wildlife. Similarly, it may be some time (if ever) before the average member of the public notices the impact of a wildlife disease—for example, a declining birth rate and a corresponding decline in population numbers—and alerts officials. By the time a novel disease is detected through passive surveillance, it may already be well established in wildlife populations. Similarly, previously unknown endemic, low-pathogenic diseases may not be detected until after they have mutated and become highly pathogenic.

Even where a wildlife disease causes a large die-off, passive surveillance may not be sufficient to detect it if it occurs in a remote area. This is especially true if the disease affects small animals that are quickly scavenged or that decompose rapidly. Consequently, officials may only learn of the disease after it has reached more populated areas. If a wildlife disease is zoonotic, has the potential to become zoonotic, or can infect other animals, intervention only after it has arrived in populated areas may not be sufficient to meet our international obligations—and the domestic need—for timely reporting of, and response to, diseases that pose a threat to human and animal health.

(ii) Research

Relying on independent researchers, most of whom are located in universities, to detect and report wildlife disease is no more effective than passive surveillance at ensuring Canada meets its international obligations for the rapid identification of infectious diseases. Governments often use funding programs to encourage independent researchers to align their activities with government priorities, but governments ultimately cannot dictate research agendas. Numerous factors contribute to a researcher's determination of her focus of study, including sources of funding, previous experience and personal interest. As a result, and in contrast to the recommendations of the *Strategic Framework*, wildlife disease detection in Canada remains dependent on the individual decisions of researchers about their research agendas. If the next zoonotic disease emerges from a

wildlife species that no one has decided to research, chances are it will only be detected after it has already had harmful human health or economic effects.

To address the root causes of EZDs, the federal and provincial governments must heed the *Strategic Framework's* call to adopt a more strategic approach to research in this area. A logical place to begin is by supporting and promoting research that establishes baseline data on the current health status of Canadian wildlife. At a minimum, baseline data will contribute to understanding the prevalence and geographic spread of diseases and will help to identify those that are endemic, at risk of moving to new populations or not yet found in Canada. Such information is essential to informing the "risk assessment" processes described below.

Furthermore, an effective commitment on the part of the governments to promoting and disseminating research may improve the ability of regulators to address the root causes of EZDs. Absent formal regulatory requirements, communication about wildlife diseases between those in the wildlife health sector and those in animal and public health sectors is often the result of personal relationships.¹³³ These relationships are formed in a number of ways, but attendance at workshops and conferences where research findings are presented is particularly important. Similarly, the publication of research findings is an essential avenue for people from different sectors or levels of government to learn of one another's efforts. Personal relationships continue to drive ad hoc integration in the absence of regulation. As such, trends of increased private-public research, which restricts the dissemination of research findings, decreased funds available for professional development and suggestions of increased political interference in the ability of government scientists to disseminate their research findings should raise alarms about the ability to find the root causes of EZDs.¹³⁴

133. I reached this conclusion after participating in a two-day workshop organized by the CCWHC for Canada's Wildlife Health Professionals designed to assess "Canada's Capacity for Rapid Wildlife Disease Investigation & Response". The workshop was held 21-22 February 2012 in Calgary, AB.

134. See Clayton Greenwood, "Muzzling Civil Servants: A Threat to Democracy?" (2013) [unpublished] online: Environmental Law Clinic, University of Victoria <http://www.elc.uvic.ca/press/documents/2012-03-04-Democracy-Watch_OIPLtr_Feb20.13-with-attachment.pdf> .

(iii) Priority Setting

The absence of a mechanism which prioritizes diseases in a manner that reflects the needs of animals, humans and wildlife leaves many significant diseases overlooked. As discussed above, passive surveillance of the health status of wildlife is insufficient to support regulatory intervention before diseases emerge. Governments must initiate a process to prioritize wildlife disease that reflects both known disease threats and likely origins of new diseases. In effect, provincial, federal and territorial governments must fully implement the *Strategy* they developed nearly a decade ago, and undertake targeted surveillance of wildlife species based on that strategy.

Two recent diseases involving amphibians and bats demonstrate that to address the root causes of EZDs, regulatory priorities must shift to include wildlife health. Consider the impact of *chytridiomycosis*, a disease that was recently confirmed in Canadian amphibians.¹³⁵ The disease, which is caused by the waterborne chytrid fungus, *Batrachochytrium dendrobatidis*, has devastated amphibian populations around the world and has been identified as a leading cause of localized extinctions and catastrophic population losses.¹³⁶ Recently the International Union for Conservation of Nature identified amphibians as the most threatened group of vertebrate species, with one third of amphibian species at risk of extinction compared to one eighth of bird species and one quarter of mammal species.¹³⁷ Canada participates in multiple international efforts to protect bird species,¹³⁸ as well as international efforts to further the

135. See Canadian Cooperative Wildlife Health Center, *A Potentially Deadly Fungus Is Widespread in BC's Frog and Toad Populations* (19 February 2013) online: Healthy Wildlife <<http://www.healthywildlife.ca>>.

136. See Erica Bree Rosenblum et al, "The Deadly Chytrid Fungus: A Story of an Emerging Pathogen" (2010) 6:1 PLoS Pathogens 1.

137. International Union for Conservation of Nature Red List, *Species Extinction: The Facts* (2007) at 1, online: International Union for Conservation of Nature <http://cmsdata.iucn.org/downloads/species_extinction_05_2007.pdf>.

138. See *Convention on Wetlands*, *supra* note 115; Kushlan et al, *supra* note 115; *Western Hemisphere Shorebird Reserve Network* (2009) online: Western Hemisphere Shorebird Reserve Network <<http://www.whsrn.org/western-hemisphere-shorebird-reserve-network>>; TD Rich et al, *supra* note 115; Trilateral Committee for Wildlife and Ecosystem Conservation and Management, *Memorandum of Understanding Establishing the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation*

conservation of mammals,¹³⁹ but gives amphibian conservation nowhere near the amount of attention or resources it directs to the conservation of mammals and birds. Canada has not entered into any international management plans to even monitor, let alone address, the rapid rate of amphibian extinction.

A further example is provided by white-nose syndrome (WNS), which affects bat populations. Since its first detection in New York state in 2006, WNS has rapidly spread across North America, with the disease recently confirmed in Ohio, South Carolina and Prince Edward Island.¹⁴⁰ Like chytridiomycosis, WNS is caused by a fungus, *Geomyces destructans*, and it is decimating bat populations.¹⁴¹ Admittedly, WNS has garnered much more attention than chytridiomycosis from both the public and the government. This has resulted in an action plan to control the spread of the disease through human activities and in calls to list bat species that have been particularly hard hit by WNS under the SARA.¹⁴²

While we know that most EZDs have a wildlife origin, we have a poor understanding of which species are most likely to be a source of disease. As a result, we also have a poor understanding of the drivers of disease emergence.¹⁴³ The new interest in understanding diseases in bats resulted from the discovery that bats may be carriers for coronaviruses like SARS,

and Management (9 April 1996) online: Trilateral Committee for Wildlife and Ecosystem Conservation and Management <<http://www.trilat.org>> .

139. See NOAA's National Marine Fisheries Service, *International Marine Mammal Action Plan 2012–2016* (Oct 2012) online: National Oceanic and Atmospheric Administration <<http://www.nmfs.noaa.gov/ia/reports/immmap.pdf>>; *Arctic Council*, online: Arctic Council <<http://www.arctic-council.org>> .

140. See National Wildlife Health Center, *White Nose Syndrome (WNS) Occurrence by County/District* by Cal Butchkoski (2013) online: National Wildlife Health Center <http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome> .

141. See Gudrun Wibbelt et al, "White-Nose Syndrome Fungus (*Geomyces destructans*) in Bats, Europe" (2010) 16:8 *Emerging Infectious Diseases* 1237.

142. The reasons for increased attention are likely three-fold. First, the magnitude of the die-offs and speed of WNS's spread raised alarm. Second, the disease was initially detected in populated areas, including public recreation areas. The public felt the immediate impact of WNS because access to these recreation areas was closed as a component of the government's efforts to respond. Third, bats are economically important in the agricultural sector as a pest control.

143. See Angela D Luis et al, "A Comparison of Bats and Rodents as Reservoirs of Zoonotic Viruses: Are Bats Special?" (2013) 280:1756 *Proceedings of the Royal Society B Biological Sciences* 1 at 2.

Ebola virus, Marburg hemorrhagic fever, Hendra virus and Nipah virus.¹⁴⁴ This example illustrates how existing regulatory frameworks have failed to address the root causes of zoonotic diseases. It was only after human health and economic consequences resulted from those diseases that attention was directed to their suspected wildlife origins. If the health needs of wildlife were properly emphasized during regulatory priority setting, bats would have been a strategic target of research much sooner because of their numbers, their diversity and their wide geographic spread.

The examples of WNS and *chytridiomycosis* also highlight opportunities to better understand the root causes of infectious diseases that would otherwise be missed because of the emphasis of human impacts in research activity.¹⁴⁵ WNS and *chytridiomycosis* present an opportunity to understand how fungus-borne diseases function.¹⁴⁶ Lessons learned in the investigation of these two diseases may provide insight into how to prevent the spread, and how to treat the growing number, of fungal infections in humans¹⁴⁷—many of which are drug-resistant.¹⁴⁸ Such lessons may also contribute to our understanding of fungal infections in plants such as *fusaria*, which threaten food security by dramatically lowering yields of corn, oats, wheat and barley.¹⁴⁹

(iv) Risk Assessment

Canada's recent experiences with the introduction of chronic wasting disease (CWD) and with the establishment of wild populations of non-native wild boars also highlight the need for considering wildlife health impacts equally with those of humans and animals in risk assessment processes. The presence of CWD in wild deer and elk populations has been attributed to the decision to allow farmed elk to be imported into

144. *Ibid.*

145. See Morgan J Trimble & Rudi J van Aarde, "Species Inequality in Scientific Study" (2010) 24:3 Conservation Biology 886 at 890.

146. See Rosenblum et al, *supra* note 136 at para 1.

147. See e.g. David W Warnock, "Fungal Diseases: An Evolving Public Health Challenge" (2006) 44:8 Medical Mycology 697.

148. See e.g. Dimitrios P Kontoyiannis & Russell E Lewis, "Antifungal Drug Resistance of Pathogenic Fungi" (30 March 2002) 359:9312 The Lancet 1135 at 1135.

149. See University Research Communications, *Making a Difference: Saskatchewan Research with Impact* (2009) at 1, online: University of Saskatchewan <<http://www.usask.ca/research/communications/sk-health-research/09.pdf>> .

Alberta from Colorado to establish an elk farm industry in the province.¹⁵⁰ The province required the importer to obtain a permit, and the elk farm needed a licence pursuant to Alberta's *Wildlife Act*,¹⁵¹ but nothing in the permit approval or licencing regime required consideration of the impact of captive wildlife on the health of wild populations. The regulatory framework was only concerned with ensuring that elk were not being taken from the wild to populate captive game farms. Nor did the *Livestock Diseases Act* address wildlife health, although it defined "livestock" broadly enough to include wildlife.¹⁵² Not surprisingly, the focus of the Act was known disease threats to domestic livestock used in agriculture.

Wild boars were similarly introduced into Canada as a game farm animal.¹⁵³ Unlike elk, farmed boars do not threaten an indigenous, wild boar species. Instead, boars that have escaped from captivity pose substantial environmental, human health and economic risks. Although non-native, the escaped boars have readily adapted to Canada's climate. With large tusks, substantial weight and an aggressive demeanor, wild boars pose a physical danger to humans and animals they perceive as a threat.¹⁵⁴ In the United States, where they have a longer history dealing with escaped wild boars, deaths from spinach contaminated with *E.coli* have been linked to wild boars' waste.¹⁵⁵ Wild boars are also estimated to cost the US \$1.5 billion annually in crop and environmental damage and they risk out-competing native wildlife for food.¹⁵⁶ The harm caused by wild boars has led Alberta to declare wild boars a pest pursuant to the *Agricultural Pests Act*¹⁵⁷ when they are found at large.¹⁵⁸ A bounty of fifty

150. See Sarah Kahn et al, "Chronic Wasting Disease in Canada: Part 1" (2004) 45:5 *The Canadian Veterinary Journal* 397 at 399.

151. RSA (1984), c W-9.1, ss 54, 58.

152. RSA 1980, c L-22, s 1(g).

153. See *Wildlife and Pest Control*, online: Parkland County <<http://www.parklandcounty.com>>.

154. See Ben C West, Andrea L Cooper & James B Armstrong, *Managing Wild Pigs: A Technical Guide* (Starkville, MS: The Berryman Institute, 2009) at 6–21.

155. See Michele T Jay et al, "Escherichia coli O157:H7 in Feral Swine near Spinach Fields and Cattle, Central California Coast" 13:12 *Dispatch* 1908 at 1910.

156. See West, Cooper & Armstrong, *supra* note 154 at 16.

157. RSA 2000, c A-8.

158. See *Pest and Nuisance Control Regulation*, AB Reg 184/2001, s 2(2).

dollars is now awarded for each set of ears obtained from an escaped boar in some Alberta counties.¹⁵⁹

Experiences with CWD and wild boars are excellent examples of how the absence of an integrated regulatory framework for infectious diseases has led to a failure to address the root causes of disease at the animal-human-ecosystem interface. In the case of farmed elk, action in one regulatory silo undermined action in another. The decision to introduce farmed elk was largely made by the Department of Agriculture, and was primarily motivated by the desire to diversify the agriculture sector. CWD was not controlled or prevented before it became a regional crisis, and from a wildlife health perspective, the risk assessment process within the existing regulatory framework for animal health failed. To avoid repeating such mistakes, risk assessment processes must explicitly take into account wildlife health impacts. Calling on regulators to broadly look at “wildlife impacts” is insufficient because the existing framework is fixated on the consumptive uses of wildlife, which overshadow wildlife health impacts.

V. Discussion

This review of government surveillance, research, priority setting and risk assessment activities demonstrates that Canada has not answered the *Strategic Framework*'s call to adopt a precautionary approach to EZDs. To meaningfully integrate wildlife into the existing regulatory framework in a way that would address the root causes of EZDs requires a fundamental shift in our regulatory response to diseases in animals and humans. Further, the federal and provincial governments must critically examine the effect of human-induced environmental changes on wildlife health. Unfortunately, the consequences of integration are not politically expedient and may be unacceptable to some. It is not surprising that little regulatory action has been taken towards integration.

The wildlife sector generally recognizes disease as a natural component of any ecological system and one that is best managed by promoting resiliency in the system.¹⁶⁰ In contrast, the health sector has little

159. See e.g. Parkland County, *Wild Boar Bounty*, online: Parkland County <<http://www.parklandcounty.com>>.

160. See G Wobeser, “Disease Management Strategies for Wildlife” (2002) 21:1 *Revue Scientifique et Technique de l’OIE* 159 at 160.

tolerance for disease in humans and animals, and often has the explicit regulatory objective of keeping disease out through biosecurity measures and eradicating disease when it does appear in humans and animals. The root causes of EZDs cannot be addressed, nor can full integration be achieved, unless these different approaches are reconciled. While it may be irresponsible to argue that biosecurity and eradication measures should be abandoned, these measures are often impractical and sometimes impossible.¹⁶¹ Overconfidence in their efficacy leads regulators to avoid addressing the role humans play in disease emergence.¹⁶² Change must therefore come from all sectors which impact wildlife health, including from within the human and animal health sectors.

There are many examples of how the regulation of wildlife health can be integrated into the human and animal health sectors. For example, insufficient attention has been paid to how animal production practices affect the health of wildlife, even though such production is a key avenue for movement of zoonotic diseases between wildlife, animals and humans.¹⁶³ The global shift to intensive production with little species diversity provides a clear example of the clash between biosecurity and wildlife resiliency approaches to disease management. From a wildlife health perspective, only resilient ecological systems are capable of buffering the effects of disease. An essential component of such resiliency is species diversity, which is incompatible with the dictates of intensive animal production.¹⁶⁴ It does not necessarily follow that intensive agriculture must be abandoned in favour of small-scale production, but in an environment where biosecurity is expected to keep disease out of poultry or pig barns, some important questions are rarely asked. For example, how many animals are too many? Infectious diseases often have both a population and a density dynamic, where rates of infection and, more importantly, rates of mutation, increase substantially as the number

161. See *ibid.*

162. All EZD outbreaks in the poultry sector have been attributed to either a breakdown in, or the inadequacy of, biosecurity measures.

163. See Patz, “Unhealthy Landscapes”, *supra* note 18 at 1094.

164. See Patz, “Human Health”, *supra* note 16 at 393.

of animals increases above a certain threshold level.¹⁶⁵ What are those threshold levels for diseases such as avian influenza and Nipah virus?

Similarly, wildlife health considerations are not included in decisions about where to site intensive livestock operations. Generally, locations away from populated areas are sought due to concerns about odours and noise from the barns. Locating intensive livestock operations in less populated areas, however, may increase direct or indirect contact with wildlife,¹⁶⁶ thereby increasing our vulnerability to EZDs. Is that choice justified merely to avoid a nuisance? A food system that relies heavily on food imports also increases the risk of introducing diseases into new areas. Given the disease introduction risks associated with the global transport of food, another question that may be asked is whether regulatory action should be directed away from increasing food imports in favour of promoting local food production.¹⁶⁷

Land use control is another area of regulation that does not pay enough attention to wildlife health. Habitat degradation and destruction have been identified as principal drivers of EZDs, yet wildlife health is at best only indirectly addressed in environmental assessments or in other development approval processes such as when acquiring drainage and forestry permits. Even when wildlife health is considered in the context of land use, the emphasis tends to be on the impact on the reproduction of a species, and on the direct risk of death from disrupting an animal's nest, den or other home. Not surprisingly, this emphasis mirrors the focus of wildlife regulation in general.

Regulatory frameworks that govern development approval processes could be amended to require proponents of development projects to explicitly address known impacts on wildlife disease. For example, accessways into forested areas can change wildlife movement patterns. Proponents of such projects should be asked whether the proposed

165. See Madan K Oli et al, "Population Dynamics of Infectious Diseases: A Discrete Time Model" (2006) 198:2 *Ecological Modelling* 183 at 184; TW Drew, "The Emergence and Evolution of Swine Viral Diseases: To What Extent Have Husbandry Systems and Global Trade Contributed to Their Distribution and Diversity" (2011) 30:1 *Scientific and Technical Review of the Office International des Epizooties* 95 at 97-98.

166. For example, contact can be made through water intake and waste storage and disposal.

167. It is recognized that Canada's international trade commitments may prevent certain kinds of regulatory action aimed at slowing food imports.

project will increase the typical contact within and between species, thereby increasing the risk of disease transmission. Similarly, drainage regulation in Saskatchewan does not require approval for “slough consolidation” within one’s own lands, but only where water flows off one’s land.¹⁶⁸ This distinction may make sense if the sole concern is with downstream flooding, but makes no sense from the perspective of wildlife health, especially as farm sizes increase. When isolated sloughs become one large body of water, migratory birds are forced to congregate in larger numbers, so infection rates will likely increase as a result during disease outbreaks.¹⁶⁹

Finally, tackling the root causes of EZDs raises the difficult issue of restricting human movement. Recent experiences in Antarctica suggest that wildlife refuges, which limit human access, can assist in preserving the health of ecosystems and wildlife.¹⁷⁰ Members of the International Association of Antarctic Tour Operators have voluntarily reduced the number of passengers and the size of ships that visit Antarctica due to the risks associated with tourism,¹⁷¹ one of which is the introduction of invasive species. A study found that each tourist carried an average of 9.5 non-native plant seeds on their clothing and footwear.¹⁷² Although specifically dealing with plant species, the study could equally have considered the pathogens carried by humans.

The limited contact approach taken in Antarctica would not fit well with the fact that promoting tourism is generally seen as a core mandate of Canada’s well-established system of provincial and national parks. More broadly, remote, pristine places and far-off, “exotic” locales are common tourism destinations. Canada’s experience with SARS, described above, exemplifies the risks of global travel, but such travel may also endanger

168. See *The Drainage Control Regulations*, RRS, c D-33.1, Reg 1, s 11(1)(f).

169. See Ramsar Convention Secretariat, *Avian Influenza and Wetlands: Guidance on Control of and Responses to Highly Pathogenic Avian Influenza*, 4th ed, handbook 4 (Gland, Switzerland: Ramsar Convention Secretariat, 2010) at 38.

170. See SL Chown et al, “Challenges to the Future Conservation of the Antarctic” (2012) 337:6091 *Science* 158.

171. The numbers of tourists increased from 6,700 during the 1992–93 season to 45,213 during the 2008–09 season. See “Antarctic tourism to be restricted”, *The Telegraph* (18 April 2009) online: The Telegraph <<http://www.telegraph.co.uk>> .

172. Steven L Chown et al, “Continent-wide Risk Assessment for the Establishment of Nonindigenous Species in Antarctica” (2012) 109:13 *Proceedings of the National Academy of Sciences* 4938 at 4939.

the health of wildlife. Human respiratory pathogens and gastrointestinal parasites have been transmitted to wild apes because of increased contact with humans.¹⁷³ Respiratory disease has been identified in virtually all studied gorilla and chimpanzee populations, and is likely a leading cause of death of chimpanzees in some areas.¹⁷⁴ While the ease of global travel, increased leisure time and globalization generally have made it easier to travel to these destinations, important questions must be answered if the root causes of EZDs are to be addressed. Just because we can reach once-inaccessible destinations, should we? Furthermore, as the SARS example highlights, if we do venture far from home and contract an infectious disease, should we be allowed to come home immediately for diagnosis and treatment?

Conclusion

In sum, Canada lacks a coherent and effective regulatory framework to address EZDs. Distinct regulatory silos respond to infectious diseases in animals and humans. The existing regulation of wildlife does not deal with infectious diseases. It focuses on managing the consumptive uses of wildlife, controlling nuisance wildlife and protecting endangered species. Wildlife diseases attract regulatory attention only where they are known to affect human health or the economy. Canada does not have the infrastructure needed to monitor the health of wildlife and to detect and respond to potential EZD threats.

Ignoring wildlife health disregards the principal source of EZDs. Simply, if wildlife are healthy, disease is less likely to spread to animals and humans. Rather than waiting for humans to feel the effects of an EZD before acting to minimize the disease's impact, the World Organization for Animal Health's *Strategic Framework* directs governments to develop integrated regulations for infectious disease control that address the root causes of disease emergence. The Canadian Cooperative Wildlife Health Centre's *Strategy* similarly calls for increased integration through better

173. See Sadie J Ryan & Peter D Walsh, "Consequences of Non-intervention for Infectious Disease in African Great Apes" (2011) 6:12 PLoS One 1, online: PLoS One <<http://www.plosone.org>>.

174. See *ibid.*

communication, collaboration and coordination among those responsible for infectious disease control.

