4-11: Infectious Disease

Hazard Impacts	Probability	Potential Impact					Score*:
		Infrastructure	Life	Economy	Environment	Average:	
Infectious Disease	2	1	3	2	1	1.75	3.5

*Score = Probability x Average Potential Impact

The Vermont Department of Health defines an infectious disease as one that is caused by micro-organisms, such as bacteria, viruses and parasites. A vector-borne disease is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes and fleas, or in some cases by mammals (e.g. rabies).

According to the Vermont Department of Health, infectious disease dynamics depend on a range of factors, including: land use, human behavior, climate, efficacy of healthcare services, population dynamics of vectors, population dynamics of intermediate hosts and the evolution of the pathogens themselves.

Many of these diseases require continuous monitoring, as they present seasonal threats to the general population. An epidemic emerges when an infectious disease occurs suddenly in numbers that are in excess of normal expectancy. Infectious disease outbreaks put a strain on the healthcare system and may cause continuity issues for local businesses. These outbreak incidents are a danger to emergency responders, healthcare providers, schools, and the public. This can include influenza (e.g. H1N1), pertussis, West Nile virus, and many other diseases.

Table 38: Threat Categories of Vector-Borne and Other Infectious Disease

Threat Classification	Disease
Diseases already present in Vermont that may be exacerbated by climate change	West Nile Virus
	Eastern Equine Encephalitis
	Lyme Disease
	Anaplasmosis
	Babesiosis
	Tularemia
	Powassan
Diseases that may spread to Vermont even without contribution of climate change, whose spread to and transmission of Vermont could be exacerbated by climate change	St. Louis Encephalitis
	Western Equine Encephalitis
	La Crosse Encephalitis
	Ehrilichiosis
	Rocky Mountain Spotted Fever
Diseases with vectors that may spread to Vermont by the end of the century under a higher emission scenario	Dengue
	Chikungunya
Disease that have competent vectors or may in the future have competent vectors in Vermont, but are unlikely to become established in Vermont despite a vector presence	Yellow Fever
	Malaria
	Chagas Disease
	Rift Valley Fever
Diseases that may be present in Vermont or may spraed to Vermont in the future but whose link with climate changes expected in Vermont is tenuous	Batonellosis
	Rabies
	Hanta Virus
	Leptospiriosis
	Plague
	Valley Fever
	Anthrax
	Q Fever

Source: Vermont Department of Health

Upon consideration of five climate and health reviews, The Vermont Department of Health separated vector-borne and other infectious diseases into five threat categories (Table 38). More details on this classification system and the diseases can be found in the 2016 Vermont Climate Health Report[1].

Infectious Disease History

Pandemic influenza, considered to be a global outbreak, spread quickly around the world and was observed in 1918, 1957, 1968 and in 2009 with the novel H1N1 strain. The 2009 H1N1 outbreak, though not considered a serious threat to Vermont, still affected some Vermonters. The great influenza epidemic of 1918 killed millions worldwide and would likely cause hundreds to thousands of deaths in Vermont should a similar outbreak occur today. It is anticipated that a more serious strain of the usual flu will occur some year and that vaccines might not be ready in time to combat rapid spread.

Lyme disease continues to pose a significant threat to Vermonters, as cases (both probable and confirmed) have been tracked by the Vermont Department of health for several decades (Figure 60).

Infectious Disease Trends & Vulnerability

According to the Centers for Disease Control (CDC), the number of reported cases of vector-borne infectious disease has more than tripled between 2004 and 2016[2].

Those infectious diseases that fall into the first threat classification category identified in Table 38 (i.e. currently present in Vermont and which may be exacerbated by climate change) are already exhibiting increased prevalence in New England. For example, with both temperature (see: Extreme Heat) and precipitation (see: Inundation Flooding & Fluvial Erosion) expected to increase in Vermont, West Nile Virus mosquito vector activity will likely increase, as well as the vector's period of activity. Similarly, between 1964 and 2010, counts of Eastern Equine Encephalitis (EEE) have continued to rise in New England, though they remain constant in the southeastern states.

Perhaps the most significant trend in infectious disease vulnerability in Vermont is that of Lyme disease, where Vermont ranks second in highest rate of disease incidence in the nation. The Vermont Department of Health reports that the number of reported cases of Lyme disease have increased dramatically over the last decade, and with shrinking winters, the potential for infection through tick bite continues to grow. Additionally, Vermont's increase in forest cover could provide a more suitable habitat for ticks and their hosts, which may lead to further spread of Lyme disease in the State. Outdoor laborers and recreationalists are especially vulnerable to Lyme disease, as exposure to ticks is greater. The southern and western halves of the State are more vulnerable to Lyme disease, as the warmer climate contributes to longer period of vector activity.

Vermont is typically not vulnerable to diseases such as HIV/AIDS, SARS, cholera, malaria, and resistant tuberculosis, though they are considered to be major disasters in some parts of the world. However, an incident that caused water supplies to become contaminated or resulted in people eating spoiled food could have significant health implications. An animal infected with the rabies virus would be a localized threat. The potential for large-scale infection of Vermont's commercial animal population with foot and mouth disease, bovine spongiform encephalopathy (i.e. Mad Cow Disease), or any number of poultry viruses, while unlikely, could cause widespread economic problems. A health threat might also result from an act of bio-terrorism.

1 http://www.healthvermont.gov/sites/default/files/documents/2017/01/CHPR_Sept7_2016.pdf
2 https://www.cdc.gov/vitalsigns/pdf/vs-0518-vector-borne-H.pdf

Given increasing trends for global travel, several diseases not typically observed in Vermont can make their way back to the State through infected travelers. For example, the Zika virus, transmitted from infected mosquitoes to humans, received international attention during an outbreak in 2015, which persists today. The CDC and Vermont Department of Health recommend pregnant women, or women attempting to become pregnant, not travel to areas of the world where Zika is present[3], as the virus can pass from mother to fetus, causing potentially significant birth defects.

The Steering Committee considered the probability of a plausibly significant infectious disease outbreak event to be Occasional, with the most significant impacts felt by people, followed then by the direct and indirect impacts to the economy.

Infectious Disease Mitigation

Given the Steering Committee's lower ranking of infectious disease outbreak in the hazard assessment, there are no actions in this plan that specifically address the hazard. However, several strategies and actions under the goal to create a common understanding of – and coordinated approach to – mitigation planning and action, focus on data acquisition and dissemination of all hazards, as well as increasing public awareness of the hazards that Vermont faces.

The Vermont Department of Health also regularly updates its website with news, events and reports that users can utilize in consideration of infectious disease mitigation[4].

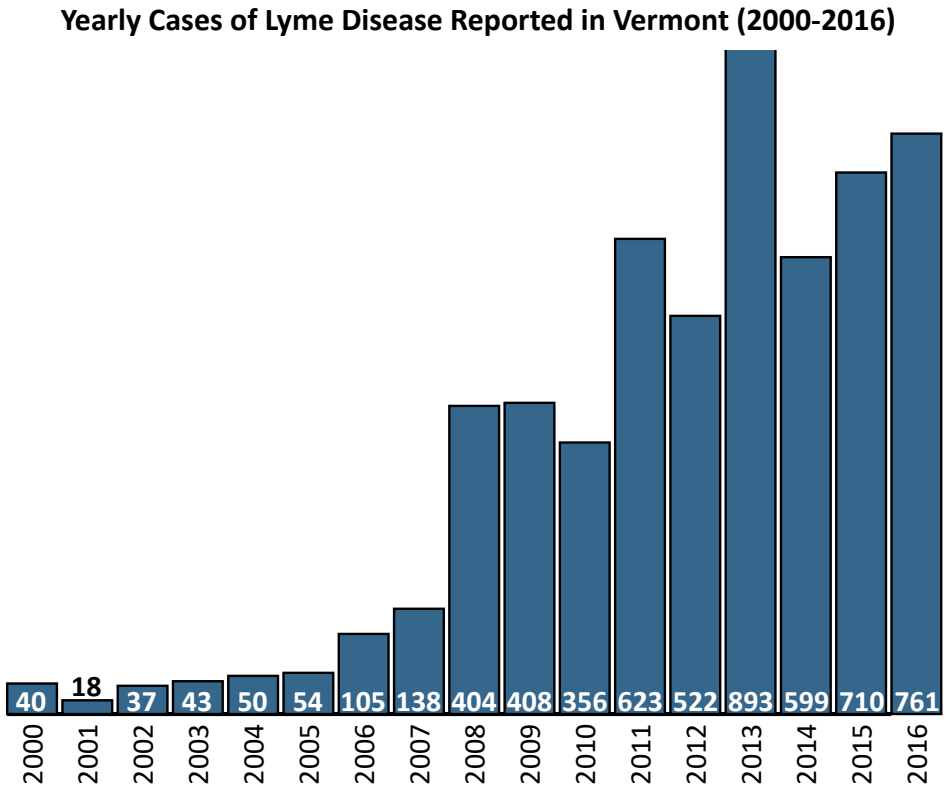

Figure 60: Yearly cases of lyme disease reported in Vermont (2000-2016)
Data Source: https://www.cdc.gov/lyme/stats/index.html

3 https://wwwnc.cdc.gov/travel/page/zika-information
4 http://www.healthvermont.gov/disease-control

Reported Lyme Disease Cases in 1996 and 2014

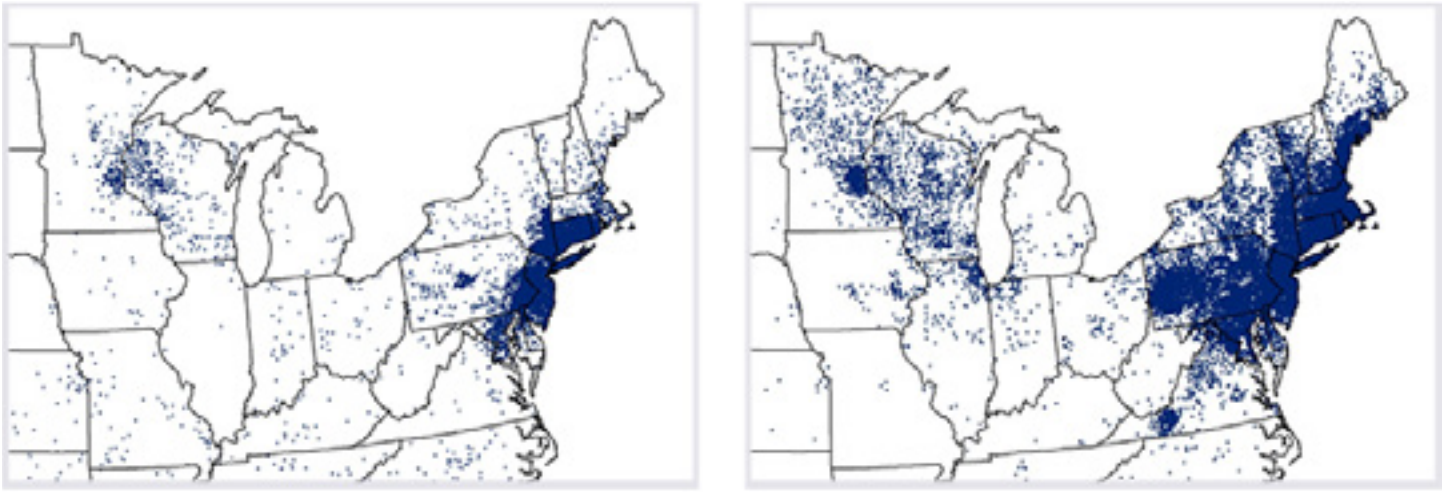

Figure 61: Reported lyme disease cases map 1996 (left) and 2014 (right)
Source: https://www.epa.gov/climate-indicators/climate-change-indicators-lyme-disease