



## 4.3.2 Disease Outbreak

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the disease outbreak hazard in Morris County.

### 2020 HMP Changes

- All subsections have been updated using best available data.
- The disease outbreak hazard now has a more comprehensive category of mosquito-borne diseases to include West Nile Virus that was discussed in the 2015 HMP.
- Previous events between 2014 and 2019 were researched, with a comprehensive list of previous events in Appendix E (Risk Assessment Supplement).
- Due to the emergence of the Coronavirus disease (COVID-19) during this planning process, a brief discussion was added to this section.

### 4.3.2.1 Profile

#### Hazard Description

An outbreak or an epidemic occurs when new cases of a certain disease, in a given population, substantially exceed what is expected. An epidemic may be restricted to one locale, or it may be global, at which point it is called a pandemic. Pandemic is defined as a disease occurring over a wide geographic area and affecting a high proportion of the population. A pandemic can cause sudden, pervasive illness in all age groups on a local or global scale. A pandemic is a novel virus to which humans have no natural immunity that spreads from person-to-person. A pandemic will cause both widespread and sustained effects and is likely to stress the resources of both the State and federal government (NJOEM 2019).

Of particular concern in Morris County are arthropod-borne viruses (arboviruses), which are viruses that are maintained in nature through biological transmission between susceptible hosts (mammals) and blood-feeding arthropods (mosquitos and ticks). More than 100 arboviruses can cause disease in humans; over 30 have been identified as human pathogens in the western hemisphere (New Jersey Department of Health and Senior Services 2008). New Jersey has been impacted by various past and present infestations including: high population of mosquitoes (mosquito-borne diseases) and deer ticks (tick-borne diseases).

Mosquito-borne diseases are diseases that are spread through the bite of an infected female mosquito. The three most common mosquito-borne diseases in New Jersey are: West Nile Virus (WNV), Eastern equine encephalitis (EEE) virus, and St. Louis encephalitis (SLE) virus. These diseases rely on mosquitos to spread. They become infected by feeding on birds carrying the virus; and then spread to humans and other animals when the mosquito bites them (New Jersey Department of Health 2013).

Tick-borne diseases are bacterial illnesses that spread to humans through infected ticks. The most common tick-borne diseases in New Jersey are: Lyme disease, Ehrlichiosis, Anaplasmosis, Rocky Mountain Spotted Fever, and Babesiosis. These types of diseases rely on ticks for transmission. Ticks become infected by micro-organisms when feeding on small infected mammals (mice and voles). Different tick-borne diseases are caused by different micro-organisms, and it is possible to be infected with more than one tick-borne disease at a time. Anyone who is bitten by an infected tick may get a tick-borne disease. People who spend a lot of time outdoors have a greater risk of becoming infected. The three types of ticks in New Jersey that may carry disease-causing micro-organisms are the deer tick, lone star tick, and the American dog tick (New Jersey Department of Health 2013b).



For the purpose of this HMP update, the following arboviruses will be discussed in further detail: West Nile Virus, Eastern equine encephalitis virus, St. Louis encephalitis virus, La Crosse encephalitis (LCE), Lyme disease, campylobacteriosis, mumps, and ebola virus. Influenza will also be discussed due to several outbreaks in the past five years. In addition, due to the COVID-19 pandemic that emerged during the development of this plan update, a brief description is described in this section.

### West Nile Virus

West Nile Virus (WNV) encephalitis is a mosquito-borne viral disease, which can cause an inflammation of the brain. WNV is commonly found in Africa, West Asia, the Middle East and Europe. For the first time in North America, WNV was confirmed in the New York metropolitan area during the summer and fall of 1999. WNV successfully over-wintered in the northeastern U.S. and has been present in humans, horses, birds, and mosquitoes since that time. WNV is spread to humans by the bite of an infected mosquito. A mosquito becomes infected by biting a bird that carries the virus (New Jersey Department of Health 2014).

### Eastern Equine Encephalitis

Eastern equine encephalitis (EEE) is a virus disease of wild birds that is transmitted to horses and humans by mosquitoes. It is a rare but serious viral infection. EEE is most common in the eastern half of the U.S. and is spread by the bite of an infected mosquito. EEE can affect humans, horses, and some birds. The risk of getting this virus is highest from late July through early October (New Jersey Department of Health 2012a). New Jersey represents a major focus for the infection with some form of documented viral activity nearly every year. Horse cases are most common in the southern half of New Jersey because the acid water swamps that produce the major mosquito vectors are especially prevalent on the southern coastal plain (Crans 2013).

### St. Louis Encephalitis

St. Louis Encephalitis (SLE) is a rare but serious viral infection. It is transmitted to humans by the bite of an infected mosquito. Most cases of SLE disease have occurred in eastern and central states. Most persons infected with SLE have no apparent illness. Initial symptoms of those who become ill include fever, headache, nausea, vomiting, and tiredness. Severe neuroinvasive disease (often involving encephalitis, an inflammation of the brain) occurs more commonly in older adults (CDC 2018).

### La Crosse Encephalitis

La Crosse Encephalitis (LAC) is transmitted to humans by the bite of an infected mosquito. Most cases of LAC occur in the upper Midwestern, mid-Atlantic and southeastern states. Many people infected with LAC have no apparent symptoms. Among people who become ill, initial symptoms include fever, headache, nausea, vomiting, and tiredness. Some of those who become ill develop severe neuroinvasive disease (CDC 2019).

### Lyme Disease

Lyme disease is an illness caused by infection with the bacterium *Borrelia burgdorferi*, which is carried by ticks. The infection can cause a variety of symptoms and, if left untreated, can be severe. Lyme disease is spread to people by the bite of an infected tick. In New Jersey, the commonly infected tick is the deer tick. Immature ticks become infected by feeding on infected white-footed mice and other small mammals. Deer ticks can also spread other tick-borne diseases. Anyone who is bitten by a tick carrying the bacteria can become infected (New Jersey Department of Health 2012b).



### Campylobacteriosis

Campylobacteriosis is a disease of the intestines caused by bacteria. People become infected by ingesting food or drink water that is contaminated with the bacteria. Most cases come from handling raw poultry, such as chicken. The bacteria are not typically spread from person to person. While outbreaks are not frequent, large outbreaks of campylobacteriosis are usually related to unpasteurized milk or contaminated water (NJ DOH 2018).

### Influenza

The risk of a global influenza pandemic has increased over the last several years. This disease is capable of claiming thousands of lives and adversely affecting critical infrastructure and key resources. An influenza pandemic has the ability to reduce the health, safety, and welfare of the essential services workforce; immobilize core infrastructure; and induce fiscal instability. Densely populated areas will spread diseases quicker than less densely populated areas (NJOEM 2019).

Pandemic influenza is different from seasonal influenza (or "the flu") because outbreaks of seasonal flu are caused by viruses that are already among people. Pandemic influenza is caused by an influenza virus that is new to people and is likely to affect many more people than seasonal influenza. In addition, seasonal flu occurs every year, usually during the winter season, while the timing of an influenza pandemic is difficult to predict. Pandemic influenza is likely to affect more people than the seasonal flu, including young adults. A severe pandemic could change daily life for a time, including limitations on travel and public gatherings (Barry-Eaton District Health Department 2013).

At the national level, the CDC's Influenza Division has a long history of supporting the World Health Organization (WHO) and its global network of National Influenza Centers (NIC). With limited resources, most international assistance provided in the early years was through hands-on laboratory training of in-country staff, the annual provision of WHO reagent kits (produced and distributed by CDC), and technical consultations for vaccine strain selections. The Influenza Division also conducts epidemiologic research including vaccine studies and serologic assays and provided international outbreak investigation assistance (CDC 2010).

### Mumps

Mumps is a viral illness which causes swelling of one or more of the parotid salivary glands located within the cheek near the jaw line and below the ears. Anyone who has not already had mumps or has not received the mumps vaccine can get the disease. The disease in adults causes more complications and more than half of the deaths due to mumps happen among people over 19 years of age. The illness spreads from person to person through talking, coughing or sneezing. Symptoms may include fever, headache, muscle aches, tiredness, loss of appetite, and swelling of the parotid salivary glands (NJ DOH 2017). The incubation period of mumps is usually 16 to 19 days, but can range from 12 to 25 days (NJOEM 2019).

### Ebola Virus

Ebola, previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus strains. According to the CDC, the 2014 Ebola epidemic is the largest in history affecting multiple countries in West Africa. Two imported cases, including one death, and two locally-acquired cases in healthcare workers have been reported in the United States. CDC and partners are taking precautions to prevent the further spread of Ebola in the United States (CDC, 2014).



## **Coronavirus**

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Coronavirus disease (COVID-19) is an infectious disease first identified in 2019. The virus rapidly spread into a global pandemic by spring of 2020. The elderly and those with underlying medical conditions such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness (WHO 2020). With the virus being relatively new, information regarding transmission and symptoms of the virus is emerging from the research. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Reported illnesses have ranged from mild symptoms to severe illness and death. Reported symptoms include trouble breathing, persistent pain or pressure in the chest, new confusion or inability to arouse, and bluish lips or face. Symptoms may appear 2-14 days after exposure to the virus (based on the incubation period of MERS-CoV viruses) (CDC 2020).

In an effort to slow the spread of the virus, the federal government and States have urged the public to avoid touching of the face, properly wash hands often, and use various social distancing measures. At the time of this plan update, there are no specific vaccines or treatments for COVID-19. However, there are many ongoing clinical trials evaluating potential treatments (WHO 2020).

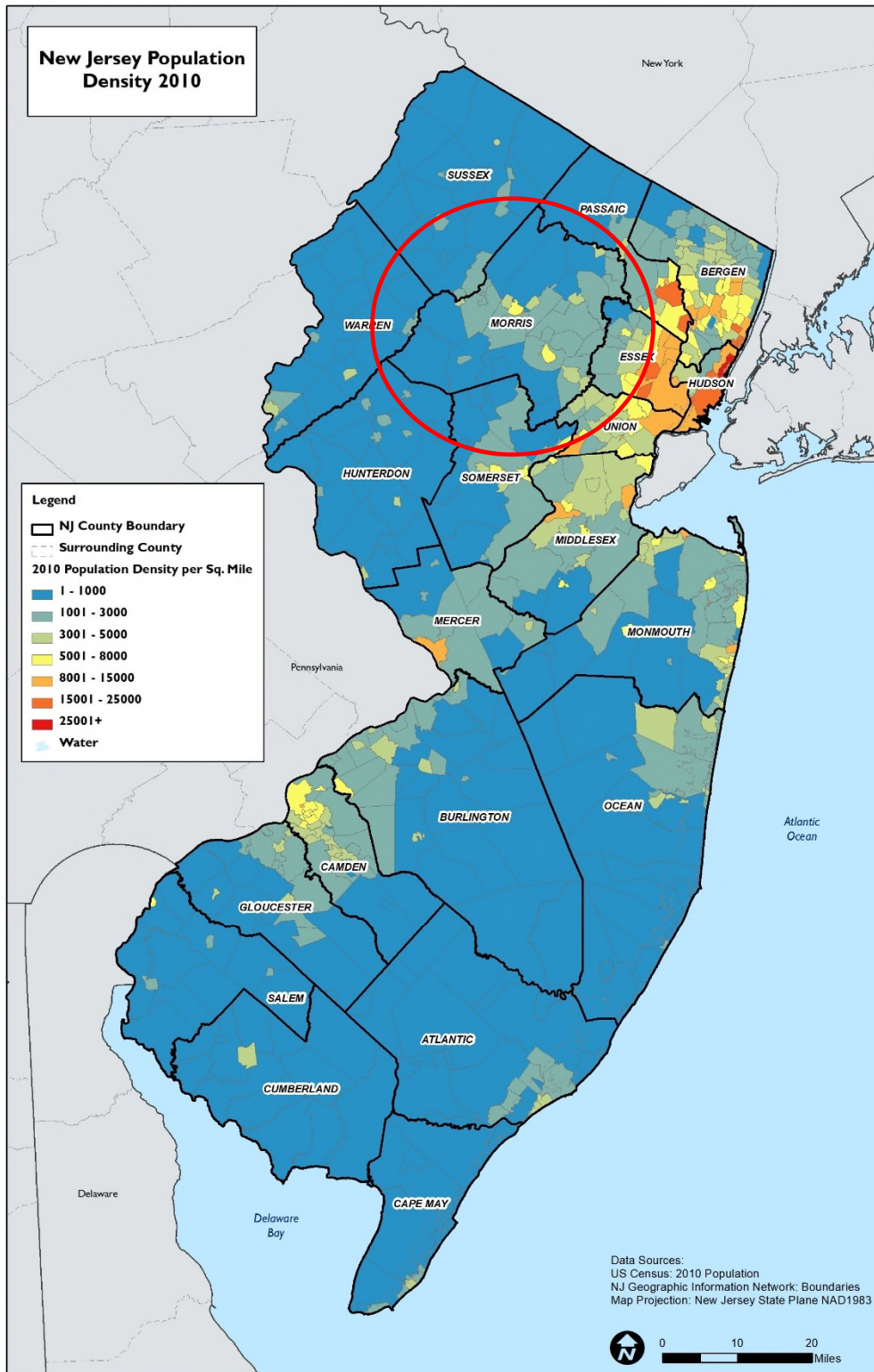
## **Location**

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New Jersey's geographic and demographic characteristics make it particularly vulnerable to importation and spread of infectious diseases. All 21 counties in New Jersey have experienced the effects of a pandemic or disease outbreak. In terms of pandemic influenza, all counties may experience pandemic influenza outbreak caused by factors such as population density and the nature of public meeting areas. Densely populated areas will spread diseases quicker than less densely populated areas. Figure 4.3.2-1 shows population density throughout the State. Additionally, much of the State can experience other diseases such as WNV due to the abundance of water bodies throughout the State, which provide a breeding ground for infected mosquitos.



Figure 4.3.2-1. New Jersey Population Density (United States Census 2010)



Source: United States Census 2010; New Jersey Geographic Information Network (NJGIN)  
 Note: Morris County is circled in red.





### Extent

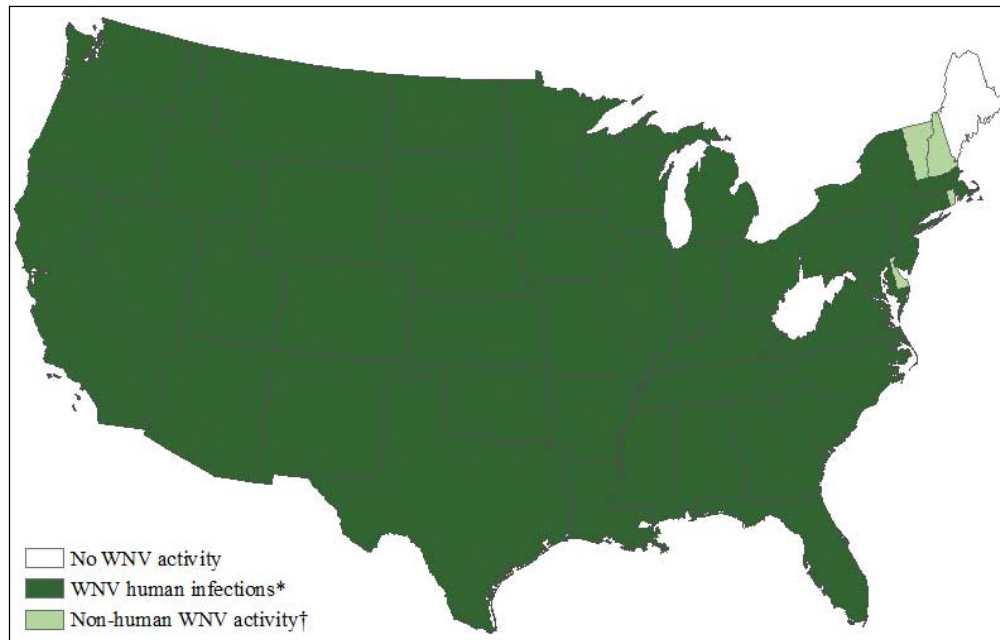
The exact size and extent of an infected population depends on how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in more densely populated areas. The transmission rate of infectious diseases will depend on the mode of transmission of a given illness.

The extent and location of disease outbreaks depends on the preferred habitat of the species, as well as the species’ ease of movement and establishment. The magnitude of disease outbreaks species ranges from nuisance to widespread. The threat is typically intensified when the ecosystem or host species is already stressed, such as periods of drought. The already weakened state of the ecosystem causes it to more easily be impacted to an infestation. The presence of disease-carrying mosquitoes and ticks has been reported throughout most of New Jersey and Morris County.

### West Nile Virus

Since it was discovered in the western hemisphere, WNV has spread rapidly across North America, affecting thousands of birds, horses and humans. As of January 2020, every state in the continental United States aside from Maine and West Virginia has WNV activity with Delaware, Rhode Island, Vermont, and New Hampshire only being impacted by non-human WNV activity. Figure 4.3.2-2 shows the activity of WNV by state.

Figure 4.3.2-2. WNV Activity by State 2019

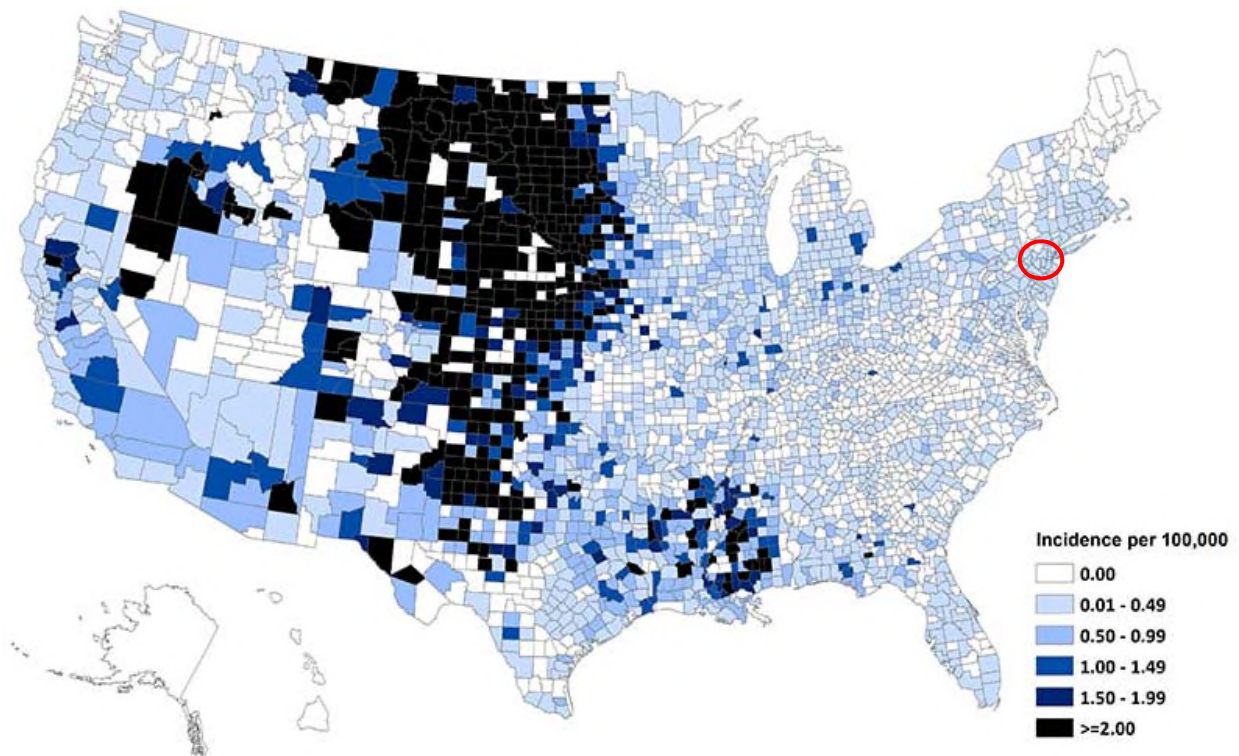


Source: CDC 2020

The CDC has a surveillance program for WNV. Data is collected on a weekly basis and reported for five categories: wild birds, sentinel chicken flocks, human cases, veterinary cases and mosquito surveillance (CDC 2019). Figure 4.3.2-3 illustrates WNV activity in the U.S. from 1999-2018.



Figure 4.3.2-3. Average Annual Incidence of West Nile Virus Neuroinvasive Disease Reported to CDC by County, 1999-2018



Source: CDC 2019

Note: The circle indicates the approximate location of Morris County.

### Eastern Equine Encephalitis

In the State of New Jersey, there has been one case of EEE from 2009-2018 (CDC 2019.)

### St. Louis Encephalitis

In the State of New Jersey, there have been no cases of St. Louis virus neuroinvasive disease from 2009-2018. However, nearby states have reported cases (CDC 2018).

### La Crosse Encephalitis

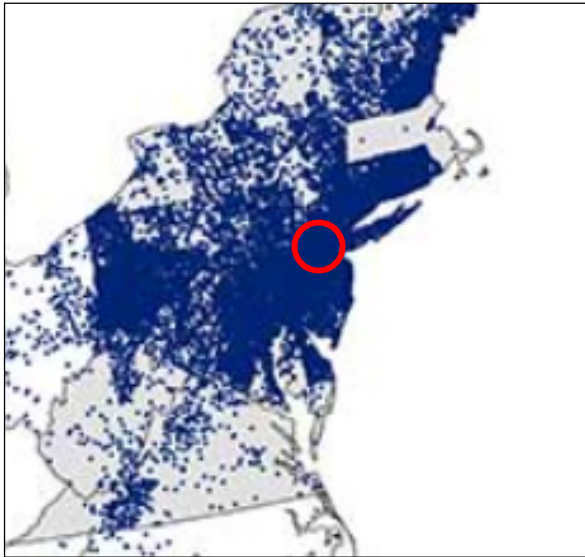
In the State of New Jersey, there have been no cases of La Crosse virus neuroinvasive disease from 2009-2018. However, nearby states have reported cases (CDC 2019).

### Lyme Disease

Lyme disease is the most commonly reported vector borne illness in the U.S. Between 2014 and 2018, there were 2,642 confirmed cases of Lyme disease in Morris County (NJ DOH 2019). Figure 4.3.2-4 shows the reported cases of Lyme disease in the northeast U.S. for 2018.



Figure 4.3.2-4. 2018 Reported Cases of Lyme Disease in the Northeast U.S.



Source: CDC 2019

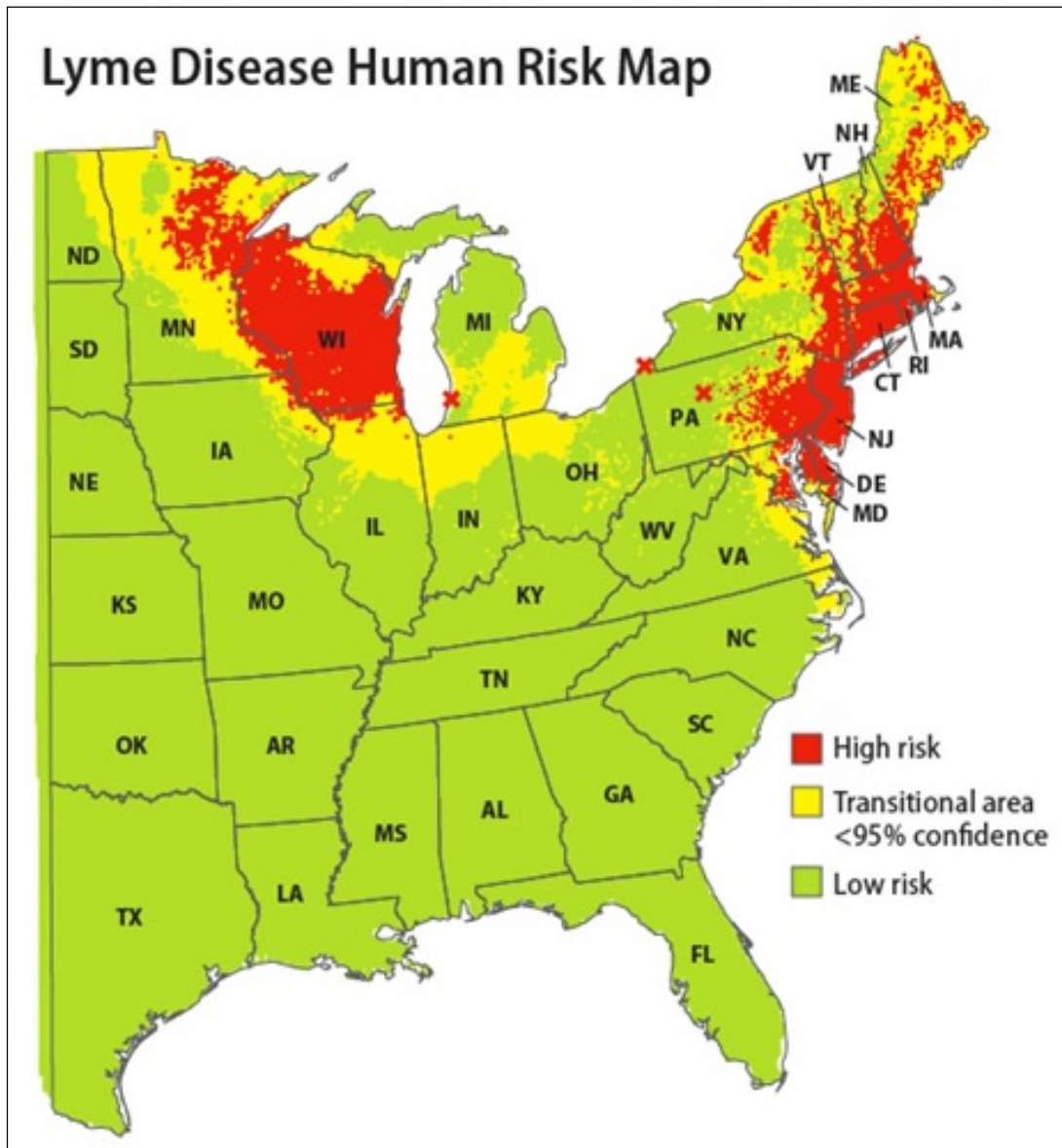
Note: The red circle indicates the approximate location of Morris County.

Figure 4.3.2-5 shows the risk of Lyme disease in the northeastern U.S. The figure indicates that Morris County is located in a high-risk area.





Figure 4.3.2-5. Lyme Disease Human Risk Map in the Northeast U.S.



Source: Yale School of Public Health, 2013

Note (1): All of Morris County located in a high-risk area.

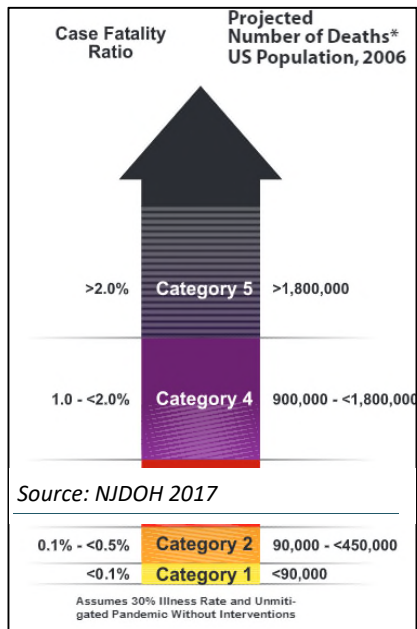
The CDC Division of Vector Borne Diseases (DVBD) indicated in 2017 that New Jersey was the state with the second-highest number of confirmed Lyme disease cases, totaling approximately 3,629 cases. For total number of cases between 2007 and 2017, New Jersey ranked third highest for the number of confirmed Lyme disease cases, totaling approximately 32,731 (12.4% of the total reported cases in the U.S.) (CDC 2018).

### Influenza, Ebola and Coronavirus

The severity of a pandemic or infectious disease threat in New Jersey will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemics around the nation have the potential to affect New Jersey’s populated areas.



Figure 4.3.2-6. Pandemic PSI



The CDC and Prevention Community Strategy for Pandemic Influenza Mitigation guidance introduced a Pandemic Severity Index (PSI), which uses the case fatality ratio as the critical driver for categorizing the severity of a pandemic. The index is designed to estimate the severity of a pandemic on a population to allow better forecasting of the impact of a pandemic, and to enable recommendations on the use of mitigation interventions that are matched to the severity of influenza pandemic. Pandemics are assigned to one of five discrete categories of increasing severity (Category 1 to Category 5) (NJDOH, 2017). Figure 4.3.2-6 illustrates the five categories of the Pandemic Severity Index (PSI).

In 1999, the WHO Secretariat published guidance for pandemic influenza and defined the six phases of a pandemic. Updated guidance was published in 2005 to redefine these phases. This schema is designed to provide guidance to the international community and to national governments on preparedness and response for pandemic threats and pandemic disease. Compared with the 1999 phases, the new definitions place more emphasis on pre-pandemic phases when pandemic threats may exist in animals or when new influenza virus subtypes infect people but do not spread efficiently. Because recognizing that distinctions between the two inter-pandemic phases and the three pandemic alert

phases may be unclear, the WHO Secretariat proposes that classifications be determined by assessing risk based on a range of scientific and epidemiological data (WHO 2009). The WHO pandemic phases are outlined in Table 4.3.2-1.

Table 4.3.2-1. WHO Global Pandemic Phases

Phase	Description
<b>Preparedness</b>	
Phase 1	No viruses circulating among animals have been reported to cause infections in humans.
Phase 2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.
<b>Response and Mitigation Efforts</b>	
Phase 4	Human infection(s) are reported with a new subtype, but no human-to-human spread or at most rare instances of spread to a close contact.
Phase 5	Characterized by human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.
Phase 6	The pandemic phase, is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.

Source: WHO 2009

In New Jersey, health and supporting agency responses to a pandemic are defined by the WHO phases and federal pandemic influenza stages, and further defined by New Jersey pandemic situations. The State’s situations



are similar, but not identical to the United States Department of Homeland Security federal government response stages. Transition from one situation to another indicates a change in activities of one or more New Jersey agencies. Table 4.3.2-2 compares the federal and New Jersey pandemic influenza phases and situations.

**Table 4.3.2-2. Federal and New Jersey Pandemic Phases and Situations**

Federal Pandemic Influenza Stage		New Jersey Situations	
0	New domestic outbreak in at-risk country (WHO Phase 1, 2, or 3)	1	Novel (new) influenza virus in birds or other animals outside the U.S.
		2	Novel (new) influenza virus in birds or other animals in the U.S./NJ
1	Suspected human outbreak overseas (WHO Phase 3)	3	Human case of novel (new) influenza virus outside of the U.S.
2	Confirmed human outbreak overseas (WHO Phase 4 or 5)	4	Human-to-human spread of novel (new) influenza outside the U.S. (no widespread human transmission)
		5	Clusters of human cases outside the U.S.
3	Widespread human outbreak in multiple locations overseas (WHO Phase 6)		
4	First human case in North America (WHO Phase 6)	6	Human case of novel (new) influenza virus (no human spread) in the U.S./NJ
5	Spread in the U.S. (WHO Phase 6)	7	First case of human-to-human spread of novel (new) influenza in the U.S./NJ
		8	Clusters of cases of human spread in the U.S./NJ
		9	Widespread cases of human-to-human spread of novel (new) influenza outside the U.S./NJ
6	Recovery and preparation for subsequent waves (WHO Phase 5 or 6)	10	Reduced spread of influenza or end of pandemic

Source: NJOEM 2019

NJ New Jersey

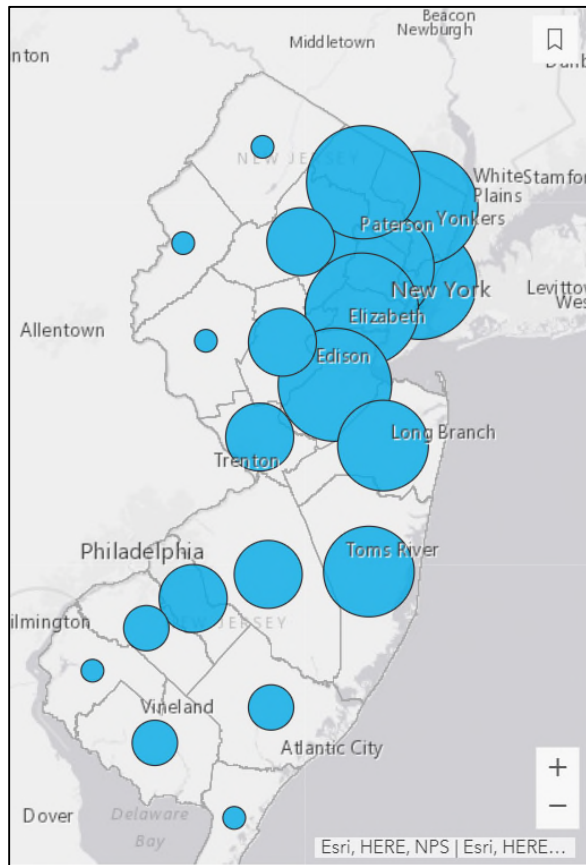
U.S. United States

WHO World Health Organization

The COVID-19 pandemic was currently impacting Morris County at the time the 2020 draft HMP was written. Figure 4.3.2-7 illustrates the number of positive cases in the County as of May 14, 2020.



Figure 4.3.2-7. Number of Positive COVID-19 Cases in New Jersey



Source: State of New Jersey Department of Health 2020 (as of May 14, 2020)

**Previous Occurrences and Losses**

Many sources provided historical information regarding previous occurrences and losses associated with disease outbreak events throughout New Jersey and Morris County. Between 1954 and 2019, the State of New Jersey was included in one disease outbreak-related emergency (EM) declaration, classified as a virus threat for West Nile Virus (EM-3156, May – November 2000). Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations. Morris County was included in this declaration (FEMA 2019).

Table 4.3.2-3. Disease Outbreak-Related FEMA Declarations for Passaic County, 1954 to 2019

FEMA Declaration Number	Date(s) of Incident	Incident Type	Incident Title
EM-3156	May 30- November 1,2000	Other	West Nile Virus
DR-4488 / EM-3451	January 20,2000 to present	Biological	New Jersey COVID-19 Pandemic

Source: FEMA 2020

For this 2020 HMP update, known disease outbreak events that have impacted Morris County between 2014 and 2019, with the exception of COVID-19 (which was updated through May 2020), are identified in Table 4.3.2-4.



Table 4.3.2-4. Disease Outbreak Events in Morris County, 2014 to 2019

Date(s) of Event	Disease Type	FEMA Declaration Number (if applicable)	Morris County Designated?	Description
2014	Campylobacteriosis	N/A	N/A	In 2014, there were 57 cases of Campylobacteriosis reported to NJ DOH.
2014	Dengue Fever	N/A	N/A	In 2014, there were two cases of Dengue Fever reported to NJ DOH.
2014	Influenza	N/A	N/A	In 2014, there were 41 cases of influenza, human isolates-type 2009 H1N1; 101 cases of influenza, human isolates-type A (subtyping not done); 27 cases of influenza, human isolates-type A H3; and 83 cases of influenza, human isolates-type B.
2014	Lyme Disease	N/A	N/A	In 2014, there were confirmed 409 cases of Lyme Disease in Morris County.
2014	Rocky Mountain Spotted Fever	N/A	N/A	In 2014, there were 3 cases of Rocky Mountain Spotted Fever in Morris County.
2014	West Nile Virus	N/A	N/A	In 2014 there was one reported case of WNV in Morris County.
2015	Campylobacteriosis	N/A	N/A	In 2015, there were 102 cases of Campylobacteriosis reported to NJ DOH.
2015	Dengue Fever	N/A	N/A	In 2015, there were two cases of Dengue Fever reported to NJ DOH.
2015	Influenza	N/A	N/A	In 2015, there were 115 cases of influenza, human isolates-type A (subtyping not done); 30 cases of influenza, human isolates-type A H3; and 20 cases of influenza, human isolates-type B.
2015	Lyme Disease	N/A	N/A	In 2015, there were confirmed 572 cases of Lyme Disease in Morris County.
2016	Campylobacteriosis	N/A	N/A	In 2016, there were 95 cases of Campylobacteriosis reported to NJ DOH.
2016	Dengue Fever	N/A	N/A	In 2016, there were two cases of Dengue Fever reported to NJ DOH.
2016	Influenza	N/A	N/A	In 2016, there were 28 cases of influenza, human isolates-type 2009 H1N1; 150 cases of influenza, human isolates-type A (subtyping not done); 1 case of influenza, human isolates-type A H1; 21 cases of influenza, human isolates-type A H3; and 73 cases of influenza, human isolates-type B.
2016	Lyme Disease	N/A	N/A	In 2016, there were confirmed 539 cases of Lyme Disease in Morris County.
2016	Mumps	N/A	N/A	In 2016, there were 2 cases of mumps in Morris County.
2016	Rocky Mountain Spotted Fever	N/A	N/A	In 2016, there was 1 case of Rocky Mountain Spotted Fever in Morris County.
2016	Zika Virus	N/A	N/A	In 2016, Morris County had nine cases of Zika that were reported to NJDOH.
2017	Campylobacteriosis	N/A	N/A	In 2017, there were 83 cases of Campylobacteriosis reported to NJ DOH.
2017	Influenza	N/A	N/A	In 2017, there were 2 cases of influenza, human isolates-type 2009 H1N1; 469 cases of influenza, human isolates-type A (subtyping not done); 88 cases of influenza, human isolates-type A H3; and 207 cases of influenza, human isolates-type B.



Date(s) of Event	Disease Type	FEMA Declaration Number (if applicable)	Morris County Designated?	Description
2017	Lyme Disease	N/A	N/A	In 2017, there were 650 confirmed cases of Lyme Disease in Morris County.
2017	Mumps	N/A	N/A	In 2017, there were 5 cases of mumps in Morris County.
2018	Campylobacteriosis	N/A	N/A	In 2018, there were 106 cases of Campylobacteriosis reported to NJ DOH.
2018	Dengue Fever	N/A	N/A	In 2018, there was one case of Dengue Fever reported to NJ DOH.
2018	Influenza	N/A	N/A	In 2018, there were 105 cases of influenza, human isolates-type 2009 H1N1; 497 cases of influenza, human isolates-type A (subtyping not done); 7 case of influenza, human isolates-type A H1; 253 cases of influenza, human isolates-type A H3; and 365 cases of influenza, human isolates-type B.
2018	Lyme Disease	N/A	N/A	In 2018, there were 472 confirmed cases of Lyme Disease in Morris County.
2018	Mumps	N/A	N/A	In 2018, there were 2 cases of mumps in Morris County.
2018	West Nile Virus	N/A	N/A	In 2018, there were four WNV human disease cases.
2019	COVID-19	DR-4488	Yes	The COVID-19 pandemic is currently taking place at the time of the HMP update. As of May 14, 2020, there were 5,952 positive cases in Morris County and 539 deaths.

Source: New Jersey Department of Health 2019; Morris County Office of Health Management 2020

N/A Not Available

WNV West Nile Virus

With disease outbreak documentation for New Jersey and Morris County being so extensive, not all sources have been identified or researched. Therefore, Table 4.3.2-3 may not include all events that have occurred in the County.



### Probability of Future Occurrences

It is difficult to predict when the next disease outbreak will occur and how severe it will be because viruses are always changing. The Department of Health and Human Services and others are developing supplies of vaccines and medicines. In addition, the United States has been working with the WHO and other countries to strengthen detection of disease and response to outbreaks. Preparedness efforts are ongoing at the national, State, and local level (NJOEM 2019). The Morris County Office of Health Preparedness is leading the effort in coordination with the Morris County Office of Emergency Management and other departments on the COVID-19 response.

In Morris County, the probability for a future disease outbreak event is dependent on several factors. One factor that influences the spread of disease is population density. Populations that live close to one another are more likely to spread diseases. As population density increases in the County, so too will the probability of a disease outbreak event occurrence and spread.

All of the critical components necessary to sustain the threat of mosquito-borne disease in Morris County have been clearly documented. Instances of the WNV have been generally decreasing because of aggressive planning and eradication efforts, but some scientists suggest that as global temperatures rise and extreme weather conditions emerge from climate change, the range of the virus in the United States will grow (Epstein, 2001). While instances of Zika have decreased since the outbreak in 2016, there is still the possibility of an outbreak occurring in the future. Therefore, based on all available information and available data regarding mosquito populations, it is anticipated that mosquito-borne diseases will continue to be a threat to Morris County.

Disease-carrying ticks will continue to inhabit the northeast, including Morris County, creating an increase in Lyme disease and other types of infections amongst the county population if not controlled or prevented. Ecological conditions favorable to Lyme disease, the steady increase in the number of cases, and the challenge of prevention predict that Lyme disease will be a continuing public health concern. Personal protection measures, including protective clothing, repellents or acaricides, tick checks, and landscape modifications in or near residential areas, may be helpful. However, these measures are difficult to perform regularly throughout the summer. Attempts to control the infection on a larger scale by the eradication of deer or widespread use of acaricides, which may be effective, have had limited public acceptance. New methods of tick control, including host-targeted acaricides against rodents and deer, are being developed and may provide help in the future (Steere, Coburn, and Glickstein, 2004).

Currently and in the future, control of Lyme disease will depend primarily on public and physician education about personal protection measures, signs and symptoms of the disease, and appropriate antibiotic therapy. Based on available information and the ongoing trends of disease-carrying tick populations, it is anticipated that Lyme disease infections will continue to be a threat to Morris County.

In Section 4.4, the identified hazards of concern for Morris County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Steering and Planning Committees, the probability of occurrence for disease outbreaks in the County is considered ‘frequent’ with a range of impacts which depend upon the outbreak.

### Climate Change Impacts

The relationship between climate change and increase in infectious diseases is difficult to predict with certainty, there are scientific linkages between the two. Increased rainfall and heavy rainfalls increase the chances of standing water where mosquitos breed. As warm habitats that host insects such as mosquitoes increase, more of the population becomes exposed to potential virus threats (The Washington Post, 2017). The notion that rising temperatures will increase the number of mosquitoes that can transmit diseases such as WNV and Zika among humans (rather than just shift their range) has been the subject of debate over the past decade. Some believe



that climate change may affect the spread of disease, while others are not convinced. However, many researchers point out that climate is not the only force at work in increasing the spread of infectious diseases into the future (NJOEM 2019).

### **4.3.2.2 Vulnerability Assessment**

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To understand risk, a community must evaluate what assets are exposed and vulnerable to the identified hazard. The following discusses Morris County’s vulnerability, in a qualitative nature, to the disease outbreak hazard.

#### **Impact on Life, Health and Safety**

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The entire population of Morris County is vulnerable to the disease outbreak hazard. Due to a lack of quantifiable loss information, a qualitative assessment was conducted to evaluate the assets exposed to this hazard and the potential impacts associated with this hazard.

Maintaining certain key functions is important to preserve life and decrease societal disruption during pandemic. Heat, clean water, waste disposal, and corpse management all contribute to public health. Ensuring functional transportation systems also protects health by making it possible for people to access medical care and by transporting food and other essential goods. Critical infrastructure groups have a responsibility to maintain public health, provide public safety, transport medical supplies and food, implement a pandemic response, and maintaining societal functions. If these workers were absent due to pandemic outbreak, these systems will fail (Global Security, 2011).

Healthcare providers and first responders have an increased risk of exposure due to their frequent contact with infected populations. Areas with a higher population density also have an increased risk of exposure or transmission of disease due to their proximity to potentially infected people. Further, the elderly and immunocompromised individuals may have increased vulnerability to becoming infected or experience exacerbated impacts depending upon the disease. Refer to Section 3 (County Profile) for summary of the vulnerable populations in Morris County.

#### **Impact on General Building Stock**

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No structures are anticipated to be directly affected by disease outbreaks.

#### **Impact on Critical Facilities**

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While the actual structures of County and municipal buildings, critical facilities, and infrastructure will not be impacted by a pandemic or disease outbreak, the effect of absenteeism on workers will impact local government services. The most significant impact on critical facilities would be the increase in hospitalization and emergency room visits that would take place as a result of the outbreak. This would create a greater demand on these critical facilities, their staff, and resources. CDC’s model estimates an increase of more than 25% in the demand for hospitalization and intensive care unit services, even in a ‘moderate pandemic’ (United States Department of Health and Human Services, 2005).

Mortuary services could be substantially impacted due to the anticipated increased numbers of deaths. The timely, safe, and respectful disposition of the deceased is an essential component of an effective response. Pandemic influenza may quickly rise to the level of a catastrophic incident that results in mass fatalities, which will place extraordinary demands (including religious, cultural, and emotional burdens) on local jurisdictions and the families of the victims (Global Security 2011).

The healthcare system will be severely taxed, if not overwhelmed, from the large number of illnesses and complications from influenza requiring hospitalization and critical care. CDC models estimate increases in





hospitalization and intensive care unit demand of more than 25%. Ventilators will be the most critical shortage if a pandemic were to occur (Global Security 2011).

### **Impact on Economy**

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The impact disease outbreaks have on the economy and estimated dollar losses are difficult to measure and quantify. Activities and programs implemented by the County may be disrupted as a result of a disease outbreak and impact the local economy.

In Morris County, the Department of Planning and Public Works has the responsibility for the Mosquito Control Program (Mosquito Division). This Division utilizes an integrated pest management program which provides a balanced approach to controlling mosquitos and reducing the annoyance and threat of disease carried by this insect. The County uses intensive surveying and monitoring to determine the number and types of mosquito species (Morris County Division of Mosquito Control 2020). The Division of Mosquito Control was allotted an annual fund in 2019 of \$1.4 million according to Morris County’s annual operating budget (Morris County 2019).

In 2012 a study was conducted on the economic impacts of seasonal influenza by county, titled “Annual economic impacts of seasonal influenza on US counties: Spatial heterogeneity and patterns” (Mao et al). This study assesses the economic risk of influenza to US counties and will be used for analysis in the risk assessment. The 2012 study on annual economic impacts of seasonal influenza by county produced estimated costs of influenza on each New Jersey County. Morris County incurred over \$15 Million in direct costs and \$34 Million in indirect costs (State of New Jersey 2019).

The Morris County Office of Health Management, in coordination with the Morris County Office of Emergency Management are working to respond to the COVID-19 pandemic. Their activity requires additional costs from the State and County to manage COVID-19 in communities. Further, there has been secondary economic impact of closing non-essential facilities to reduce the spread of the virus. The final costs of this virus are still to be determined.

### **Impact on Environment**

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Disease outbreaks may have an impact on the environment if the outbreaks are caused by invasive species. Invasive species tend to be competitive with native species and their habitat. One study has shown that invasive mosquitos such as the Asian tiger mosquito, a common invasive mosquito found in New Jersey, have “desiccation-resistant eggs,” which means that they have enhanced survival in inhospitable environments (Juliano and Lounibos 2005). This species are considered competitive predators, and will prey on other species of mosquitos and a range of insects disrupting the natural food chain. Invasive species of mosquitos can be the major transmitters of disease like Zika, dengue, and yellow fever (Placer Mosquito and Vector Control District 2019).

Secondary impacts from mitigating disease outbreaks could also have an impact on the environment. Pesticides used to control disease carrying insects like mosquitos have been reviewed by the EPA and department of health. There are varying products that can be used to kill mosquitos (Morris County Division of Mosquito Control 2020). The Division of Mosquito Control calls these products “low impact”. If these sprays are applied in large concentrations, they could potentially leach into waterways and harm nearby terrestrial species. However, there is a law in New Jersey’s Pesticide Regulations that states “no person shall distribute, sell, offer for sale, purchase, or use any pesticide which has been suspended or canceled by the EPA, except as provided for in the suspension of cancellation order” (New Jersey nd).



### Future Changes that May Impact Vulnerability

Understanding future changes that may impact vulnerability in the county can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The county considered the following factors that may affect hazard vulnerability:

- Potential or projected development.
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

### Projected Development and Change in Population

Any areas of growth could be potentially impacted by the disease outbreak hazard because the entire planning area is exposed. Additional development of structures near waterbodies or areas with high population density are at an increased risk to certain types of diseases (e.g., mosquito-borne diseases).

As population continues to increase in the County, there may be at increased risk to certain diseases. If the commuter population to and from New York City increases, there may be increased exposure to diseases that emerge first in the more densely populated city. Higher concentrations of persons traveling via public transportation may become more vulnerable to the exchange of disease through airborne transmission. According to a population study completed for Morris County in 2017, persons traveling by public transportation increased from 3.9% to 5.4% between 2010 and 2015 (Morris County 2017). While this is a small fraction compared to persons who drive a personal vehicle, there are now more persons potentially exposed.

Further, as the population ages there may be increased risk to this demographic. Older adults and people who have severe underlying medical conditions like heart or lung disease or diabetes seem to be at higher risk for developing more serious complications from certain diseases, such as COVID-19.

### Climate Change

As discussed earlier in this section, the relationship between climate change and increase in infectious diseases is difficult to predict with certainty, however there may be linkages between the two. Changes in the environment may create a more livable habitat for vectors carrying disease as suggested by the Centers for Disease Control and Prevention (CDC n.d.). Localized changes in climate and human interaction may also be a factor in the spread of disease.

### Change of Vulnerability Since the 2015 HMP

Overall, the County’s vulnerability has not changed, and the entire County will continue to be exposed and vulnerable to disease outbreak events.