14. INFESTATION

14.1 HAZARD PROFILE

14.1.1 Hazard Description

For the purpose of this HMP, an infestation is defined as a state of being overrun by any organism (insect, mammal, bird, parasite/pathogen, fungus, non-native species) that is a threat to other living species in its environment. Infestations can destroy natural habitats and cropland, impact human health, and cause disease and death among native plants, wildlife, and livestock. They result when pest organisms occupy affected areas in quantities large enough to be harmful, threatening, or obnoxious to native plants, animals, and humans. Pests compete for natural resources, and they may transmit diseases to humans, crops, and livestock.

The infestation hazard profile for this HMP focuses on the seven pests described in the sections below, which have had historical presence in Sussex County. For more information on human health impacts caused by infestations, refer to Chapter 7 (Disease Outbreak).

Hemlock Woolly Adelgid

The hemlock woolly adelgid (*Adelges tsugae*) is a tiny insect from Asia that was first discovered in the Pacific Northwest in the 1920s and has since spread across the United States. Its preferred host tree is hemlock, but it may also attack spruce. A tree infested with hemlock woolly adelgid will develop gray-green needles and cotton-like wool tufts under the needles. Frequent inspection of susceptible trees for signs of hemlock woolly adelgid may allow for intervention to prevent the tree from dying (USDA 2005, NJDEP 2023).

Source: NJDEP 2023

Mosquitoes

Mosquito infestations can result in the spread of disease such as West Nile virus, eastern equine encephalitis, and Zika virus. Mosquitos typically lay eggs in or near standing water (CDC 2016). For more information on infectious disease spread by mosquitoes, refer to Chapter 7 (Disease Outbreak).

Emerald Ash Borer

Emerald ash borer (*Agrilus planipennis* or EAB) was first discovered in Somerset County in 2014 and has spread through the northern half of New Jersey. This Asian beetle infests and kills North American ash tree species, including green, white, black, and blue as (NJDEP 2023). The insect is typically present from late May through early September and is most common in June and July. Signs of infection include tree canopy dieback and yellowing and browning of leaves. Most trees die within two to four years of becoming infested. The New Jersey Department of Agriculture (NJDA) is coordinating New Jersey's EAB biocontrol program (New Jersey Department of Agriculture 2016).

Source: New Jersey Department of Agriculture 2016

The U.S. Department of Agriculture (USDA) operates the biological control production facility in Michigan to produce EAB parasitoids for release. To be considered for inclusion in the parasitoid release program, sites must meet the following criteria: the site must be forested and at least 40 acres in size; the site must contain no less than 25 percent ash of varying age classes; ash trees must be relatively healthy; and EAB must be detected in close proximity to the release site, in low to moderate densities (United States Department of Agriculture 2020).

Spotted Lanternfly

The spotted lanternfly (*Lycorma deliculta*) is an Asian plant hopper. The adults are colorful, with a black head, grayish black spotted forewings, and reddish black spotted hind wings. Adults are approximately 1 inch in length and are present from mid-July through the fall, mating and laying eggs. Egg masses are laid on smooth surfaces and appear like a patch of mud (New York State Integrated Pest Management n.d.).

Source: NJDEP 2023

Spotted lanternfly is an invasive species in the United States and could be devastating to New Jersey crops and hardwood trees. This insect was confirmed in Pennsylvania in September 2014 and in New Jersey in 2018 (NJDEP 2023).

The spotted lanternfly has sucking mouthparts that it inserts into plant tissues to remove the fluids it uses for food. Feeding occurs on the trunk and limbs of plants, not on the fruit or leaf tissues. Adults and nymphs feed in large congregations on woody tissue. During feeding, the insect excretes significant amounts of honey dew (or sugar water). Honey dew deposits provide a food source for a sooty mold fungus that can grow on plant surfaces and fruit, leading to reduced photosynthesis and plant vigor and to additional plant damage (New Jersey Department of Agriculture 2023).

White-Tailed Deer

White-tailed deer (Odocoileus virginianus) can be found from southern Canada to South America. In summer, they typically live in fields and meadows. During the winter, the deer generally keep to forests. White-tailed deer are herbivores, grazing on most available plant foods. Their diet includes leaves, twigs, fruits and nuts, grass, corn, alfalfa, lichens, and other fungi. Though sometimes seen during the day, white-tailed deer are primarily nocturnal, browsing mainly at dawn and dusk (National Geographic n.d.).

There are not many natural predators to white-tailed deer, which causes some areas to experience an overpopulation of deer (National Geographic 2023). White-tailed deer are a nuisance throughout the state, except for the most urbanized areas, affecting forests, farms, gardens, backyards, and roadways. Negative impacts on humans include car accidents, depredation of agricultural and ornamental plantings, and the potential for harboring diseases that are transmissible to people or domestic animals. The size of the deer population in New Jersey is managed through controlled sport hunting to maintain healthy deer populations at a density tolerable to residents (New Jersey Department of Fish and Wildlife 2023).

Canada Geese

Canada geese (*Branta canadensis*) are one of the most widely distributed waterfowl species in the United States. After near extinction, the species bounced back to numbers far exceeding historical estimates due to regulatory actions, habitat restoration, species conservation initiatives, and increased human-built habitat such as mowed lawns, golf courses, and stormwater detention basins.

Two classes of Canada geese exist in the United States: migratory and resident. Migratory Canada geese (considered the Atlantic population) are those that breed north of the continental United States in Alaska and in Newfoundland and Labrador, Canada. These birds spend the nonbreeding season, typically between October and February, in the United States and northern Mexico. Resident Canada geese are those that spend the entire year within the continental United States. Considered a nuisance by some and a culturally important species by others, resident geese significantly affect both human and ecosystem health (Rutgers University 2013).

Harmful Algal Bloom

A harmful algal bloom (HAB) is a rapid increase in the population of algae in freshwater or saltwater systems that can be dangerous to people, animals, or the ecology. HABs can produce toxins that kill fish, mammals and birds, and may cause human illness or even death in extreme cases. Contact with water containing HABs can cause health effects including diarrhea, nausea or vomiting; skin, eye, or throat irritation; and allergic reactions or breathing difficulties (Centers for Disease Control and Prevention 2022, Centers for Disease Control and Prevention 2022). Routes of exposure include eating, breathing, or skin contact.

There is no scientifically sound treatment to eliminate HABs from water bodies, so advanced and continuous monitoring is the key to protecting health and assessing when an affected water body is safe for swimming and other recreational activities (New Jersey Department of Environmental Protection 2023). The EPA has established an incident checklist for HAB incidents impacting water utilities. This tool is available to help utilities detect, identify, and monitor a bloom (United States Environmental Protection Agency 2017). The County is recommended to coordinate with water suppliers to ensure that purchased water is clear of harmful algae, thus maintaining the safety of users of the water.

14.1.2 Location

Due to Sussex County's landscape diversity, the entire County has the potential to be impacted by each of the species identified. Bodies of water have the potential to be impacted by HABs.

Hemlock Woolly Adelgid

Hemlock woolly adelgid are found throughout New Jersey and elsewhere throughout the northeast (see Figure 14-1). Stokes State Forest, located in Branchville, Sussex County, contains about 25 acres of old-growth hemlock and hardwood trees in a 525-acre ravine (Inside Jersey 2014).

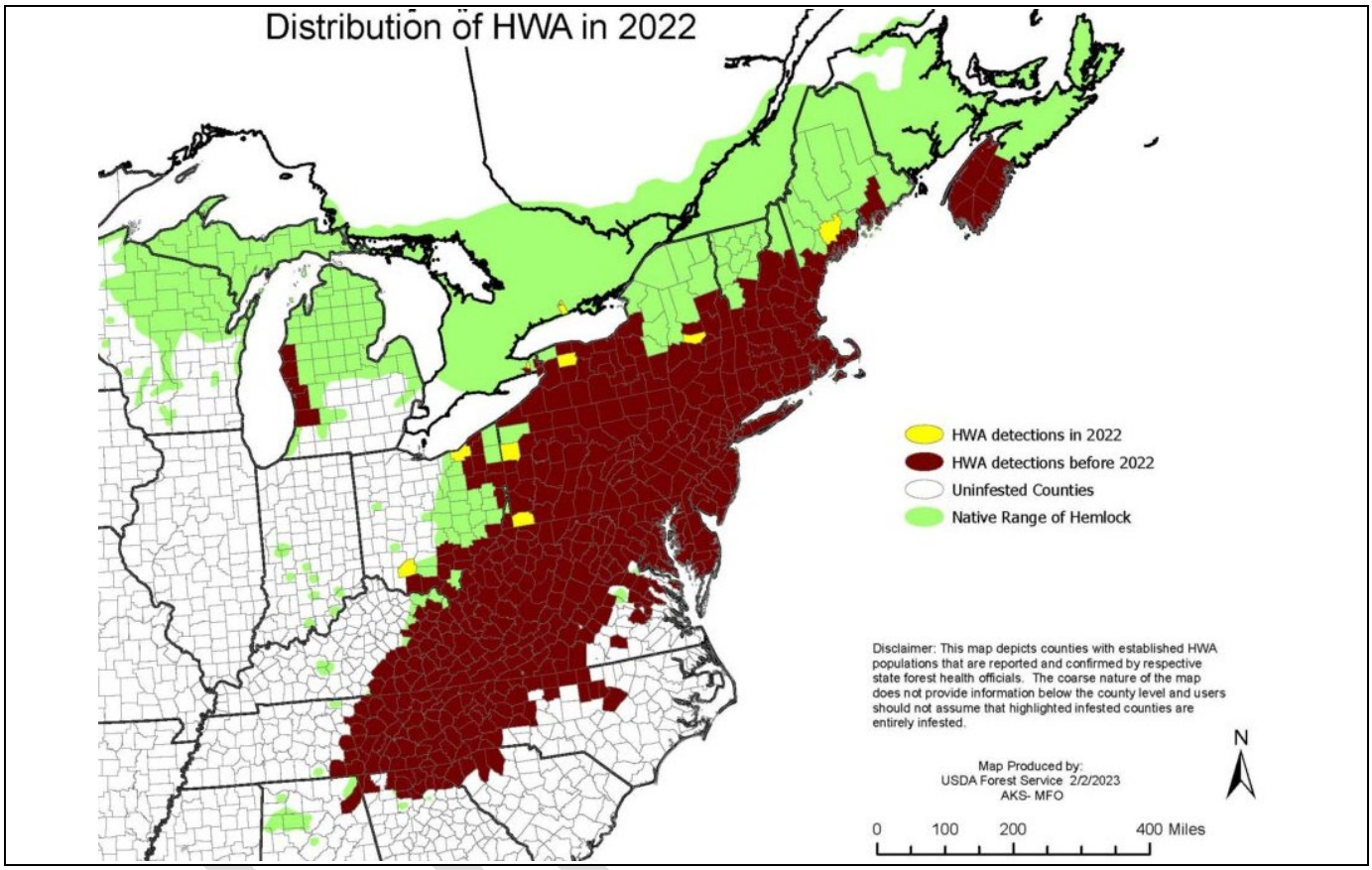
Mosquitoes

Sussex County has large areas with the potential to breed mosquitoes. These areas include farmland, private yards, stormwater facilities, and sewer plants. These areas need to be addressed as best as possible to control mosquitoes and the viruses they can spread.

Emerald Ash Borer

Three species of ash are native to Sussex County, and all are susceptible to EAB: white ash *(Fraxinus americana),* green ash *(Fraxinus pennsylvanica*), and black ash (*Fraxinus nigra*). Approximately 9 percent of the State's total forested area, with 24.7 million ash trees, is susceptible to an EAB infestation. Most of the ash is concentrated in the northwestern part of the state. Municipalities in Sussex County that have had EAB populations detected include the Township of Montague, the Township of Walpack, the Township of Sparta, the Township of Vernon, the Township of Stillwater, and the Township of Sandyston (New Jersey Forest Service 2020).

Figure 14-1. Hemlock Woolly Adelgid Distribution in the Eastern United States, 2022



Source: Purdue University 2023

Spotted Lanternfly

The spotted lanternfly can feed on more than 70 plant species, including cultivated grapes, fruit trees, and hardwood trees. One tree of particular importance is *Ailanthus altissima* or the tree of heaven, which is common in New Jersey. Tree of heaven typically grows in clumps in sunny areas along highways or disturbed habitats such as the edges of crop fields, open spaces, or parks. Other key hosts include black walnut red maple and agricultural crops such as grapes, hops, apples, and peaches (NJDEP 2023). Affected areas in New Jersey include Atlantic, Bergen, Burlington, Camden, Cumberland, Essex, Gloucester, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Passaic, Salem, Somerset, Sussex, Union, and Warren counties (NJDEP 2023).

White-Tailed Deer

White-tailed deer are found throughout Sussex County. They are most often found on the edge of wooded areas. In the heat of summer, they typically inhabit fields and meadows, using clumps of broad-leaved and coniferous forests for shade. During winter they generally keep to forests, preferring coniferous stands that provide shelter from the cold (National Geographic n.d.).

Canada Geese

Canada geese are found throughout Sussex County. They are most often found near water bodies and areas with extensive lawns and low-lying vegetation, such as parks, recreational fields, and farms.

Harmful Algal Bloom

HABs have can impact fresh or salt water bodies throughout Sussex County. Swartswood Lake, Lake Hopatcong, Lake Owassa, Lake Neepaulin, Lake Musconetcong, and Highland Lake have a history of being impacted by HABs.

14.1.3 Extent

The magnitude of infestations and invasive 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.

Hemlock Woolly Adelgid

The hemlock woolly adelgid nymphs and adults feed on sap from the tree's twigs. The tree drops its needles and, if left uncontrolled, the adelgid can kill a tree within a year. Treatment involves manual removal of infected tree branches or spraying of horticultural oils. Nearly all hemlock in New Jersey, approximately 25,000 acres, have been infested with hemlock woolly adelgid to some extent (NJDEP 2023).

Mosquitoes

The extent of mosquito-borne viruses is described in Chapter 7 (Disease Outbreak). Disease impacts can result in flu-like symptoms, brain damage, or death.

Emerald Ash Borer

The New Jersey Emerald Ash Borer Task Force predicts a 99 percent mortality rate for untreated ash trees. Peak die-off is likely to occur nine to 10 years after initial infestation. Management options for EAB include tree removal, treating with insecticides, and biological controls (the release of wasps which act as parasitoids for egg and larvae).

Spotted Lanternfly

Infestations of spotted lanternfly can result in decimation of crops, forest habitat, and landscaping (New Jersey Department of Agriculture 2023). Spotted lanternflies are invasive and can be spread long distances by people who move infested material or items containing egg masses.

White-Tailed Deer

Deer are selective browsers, and over time, herds can eat some plants out of existence and reduce the populations of other plants. Because tree seedlings are especially vulnerable to hungry deer, the future species composition of forests can be determined by deer browsing. While trees eventually grow out of a deer's reach, many other plants never do. Because deer browsing can significantly change habitat composition, it also exerts a strong influence on other animal populations (NJDEP 2019).

Canada Geese

Canada geese are carriers of bacteria and parasites that may harm humans. The bacterium most associated with Canada goose droppings is the fecal coliform, *Escherichia coli* (*E. coli*). High levels of *E. coli* can result in closure of recreational waterways. Canada geese can be a threat to aircraft and can result in air strikes. Aggressive behavior of nests and protection of goslings can result in attacks on humans and pets in areas commonly used for recreational purposes. Canada goose damage in agricultural systems can be severe (Rutgers University 2013).

Harmful Algal Bloom

Some, but not all, HABs produce chemicals that can be toxic to humans and animals if ingested, inhaled, or contacted by skin or mucous membranes. These toxins can also accumulate in fish and shellfish, which can cause illness if consumed (Centers for Disease Control and Prevention 2023). NJDEP has an algal bloom sampling dashboard (HAB Interactive Map Reporting and Communication System) online with samples categorized in accordance with alert levels as displayed in Table 14-1 (New Jersey Department of Environmental Protection 2023).

Table 14-1. Harmful Algal Bloom Alert Levels

HAB Alert Level	Criteria	Recommendation
HAB Not Present	HAB reported and investigated. No HAB present.	None
WATCH Suspected or confirmed HAB with potential for allergenic and irritative health effects	Suspected HAB based on field survey OR Confirmed cell counts 20,000 – 80,000 cells/mL AND No known toxins above public health thresholds	**Public Bathing Beaches Open** Waterbody Accessible: • Use caution during primary contact (e.g. swimming) and secondary (e.g. non-contact boating) activities • Do not ingest water (people/pets/livestock) • Do not consume fish • An alert is initiated at beaches if cell counts are 40,000 – 80,000 cells/mL. This begins actions to monitor the beach more frequently due to increasing potential for toxin production and to ensure the HAB has not elevated to a higher risk tier.
ADVISORY Confirmed HAB with moderate risk of adverse health effects and increased potential for toxins above public health thresholds	Lab testing for toxins Microcystins: ≥2 micrograms per liter (µg/L) Cylindrospermopsin: ≥5 µg/L Anatoxin-a ≥15 µg/L Saxitoxin-a ≥0.6 µg/L OR Confirmed cell counts ≥80k ug/L	**Public Bathing Beaches Closed** Waterbody Remains Accessible: • Avoid primary contact recreation • Use caution for secondary contact recreation • Do not ingest water (people/pets/livestock) • Do not consume fish
WARNING Confirmed HAB with high risk of adverse health effects due to high toxin levels	Toxin (microcystin) 20 – 2,000 µg/L	**Public Bathing Beaches Closed** • Avoid primary contact recreation • Use caution for secondary contact recreation • Do not ingest water (people/pets/livestock) • Do not consume fish • May recommend against secondary contact recreation
DANGER Confirmed HAB with very high risk of adverse health effects due to very high toxin levels	Toxin (microcystin) ≥2,000 µg/L	**Public Bathing Beaches Closed** • Avoid primary contact recreation • Use caution for secondary contact recreation • Do not ingest water (people/pets/livestock) • Do not consume fish • May recommend against secondary contact recreation • Possible closure of all or portions of waterbody and possible restrictions of access to the shoreline.

Source: NJDEP 2023

Cyanobacteria blooms are one of the most common freshwater HABs and have been identified by NJDEP as being present in Sussex County blooms. Cyanobacteria are known to produce toxins from the following classes (United States Envionrmental Protection Agency 2023):

- **Endotoxins:** Endotoxins associated with cyanobacteria have been tied to fever and inflammation in humans that have come in contact with water that contains cyanobacterial blooms.
- **Hepatotoxins:** Hepatotoxins are commonly tied to animal poisonings that are associated with cyanobacterial blooms. Animals may exhibit weakness, heavy breathing, paleness, cold extremities, vomiting, diarrhea, and bleeding in the liver. In humans, hepatotoxins have been indicated to promote tumors and may lead to increases in liver cancer. Some types of hepatotoxins, such as microcystin, can persist in fresh water for up to 2 weeks before being naturally broken down (algae).
- **Neurotoxins:** Neurotoxins act to block transfers between neurons. Extreme cases can result in paralysis.

14.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Sussex County has not been included in any major disaster (DR) or emergency (EM) declaration for infestation-related events (FEMA 2024).

USDA Declarations

The U.S. Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans from the U.S. Department of Agriculture (USDA) to producers suffering losses in those counties and in contiguous counties. Since the previous Sussex County HMP, the County has not been included in any USDA infestation-related agricultural disaster declarations (USDA 2024).

Previous Events

Hemlock Woolly Adelgid

Hemlock woolly adelgid is now common throughout New Jersey.

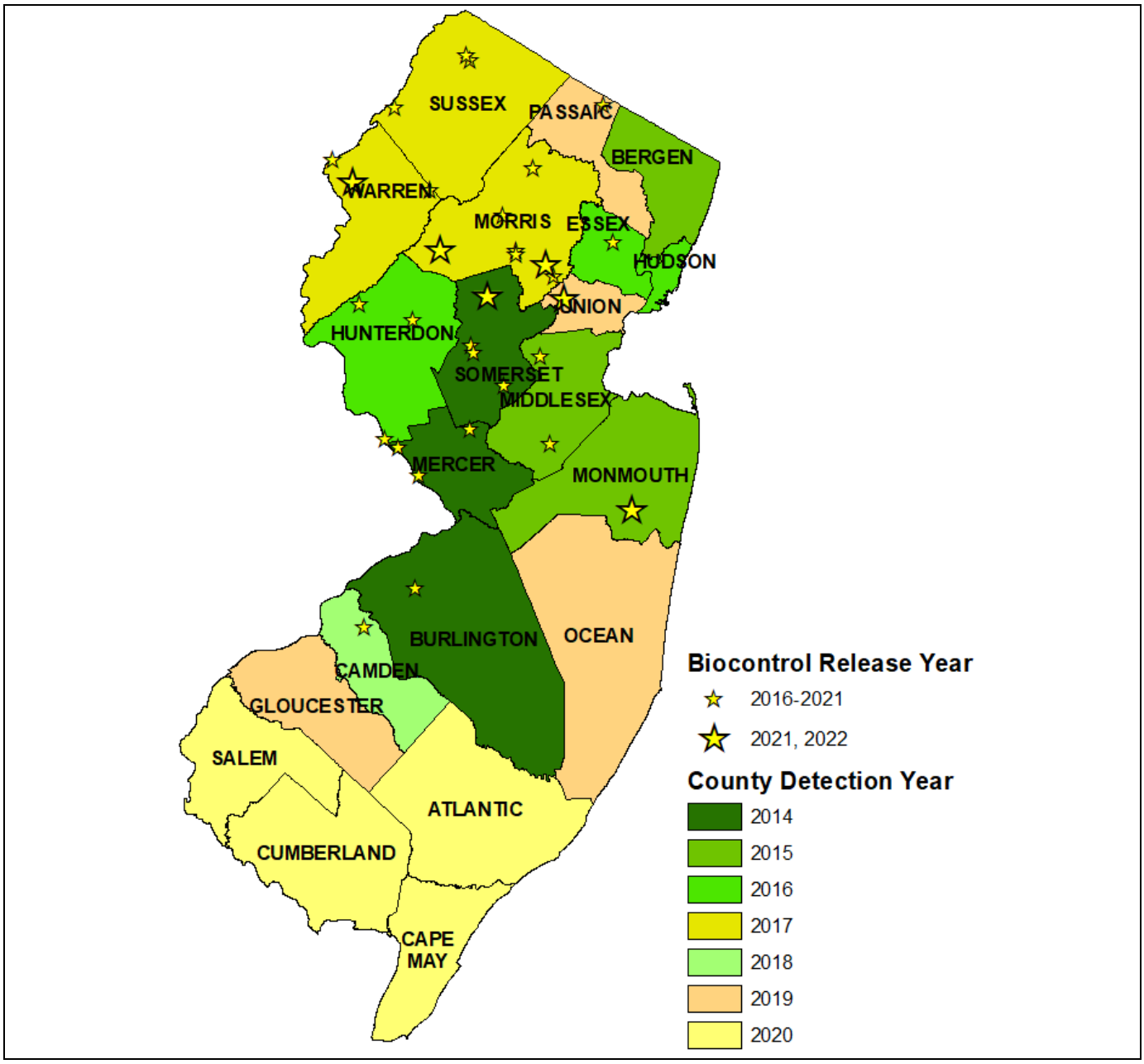
Mosquitoes

Additional mosquito species such as the Asian tiger mosquito (*Aedes albopictus*) have been introduced or expanded their range into the state and Sussex County in recent decades.

Emerald Ash Borer

Emerald ash borer was first identified in Sussex County in 2017 and has continued to impact additional municipalities in the last several years. Three biocontrol releases were conducted between 2016 and 2021. See Figure 14-2 for detection years and biocontrol releases by county.

Figure 14-2. Emerald Ash Borer Detections and Biocontrol Releases in New Jersey (as of December 2, 2022)



Source: New Jersey Department of Agriculture 2022

Spotted Lanternfly

Spotted lanternflies entered Sussex County as of fall 2020.

White-Tailed Deer

The white-tailed deer population has a history of impacting agriculture in Sussex County.

Canada Geese

Canada geese overpopulation has a history of impacting agriculture throughout Sussex County.

Harmful Algal Bloom

In 2019, recreational use of Lake Hopatcong was severely limited due to HABs. Freeholder boards in Sussex and Morris counties have agreed to allocate a total of $50,000 in matching funds to support an application by the Lake Hopatcong Commission for a potential $500,000 state grant to study and reduce HABs (New Jersey Department of Environmental Protection 2020). Table 14-2 displays the number of HAB alerts in Sussex County between 2020 and 2023. These alerts occurred on the Swartswood Lake, Lake Hopatcong, Lake Owassa, Lake Neepaulin, Lake Musconetcong, and Highland Lake (New Jersey Department of Environmental Protection 2023).

Table 14-2. Harmful Algal Bloom Alerts, 2020-2023

Year	Alerts Issued	
	Watch	Advisory
2023	12	5
2022	10	15
2021	13	8
2020	9	5

Source: New Jersey Department of Environmental Protection 2023

14.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Based on historical records and input from the Steering Committee, the probability of occurrence for infestation in Sussex County is considered “occasional.”

Effect of Climate Change on Future Probability

By 2050, temperatures in New Jersey are expected to increase by 4.1 to 5.7° F (see Section 3.3.4). A warmer climate would extend the active insect season and allow for species that are not as cold tolerant to move north and expand their range. This increases the extent of invasive insects and their related impacts. This will affect food webs and hierarchies in ecosystems, which will alter the composition of the typical ecosystem (USDA n.d.).

Warmer temperatures could lead to an increase in the length of the algal growing season and increase the likelihood of HABs. In addition to warmer temperatures and heavy precipitation events, carbon dioxide levels are forecast to continue to increase. Higher levels of carbon dioxide in the atmosphere and water can lead to increased algal growth, particularly for cyanobacteria that float at the surface (United States Environmental Protection Agency 2022).

14.1.6 Cascading Impacts on Other Hazards

Infestations can contribute to the severity or occurrence of other hazards. Dead and weakened trees from various insect species increase the risk of trees falling during windstorms and as heavy snow compounds on tree limbs and

branches. Furthermore, dead and weakened trees can contribute to an increase in fuel for wildfires. Dried vegetation can fuel wildfires and reduce the soil stability of steep slopes, which can lead to an increased risk of landslides. The removal of vegetation from slopes, potentially from white tailed deer and Canada geese grazing, can contribute to the likelihood of landslide events.

14.2 VULNERABILITY AND IMPACT ASSESSMENT

All of Sussex County is considered exposed to infestations and invasive species, with waterbodies potentially vulnerable to HABs. The following text evaluates Sussex County's vulnerability in a qualitative nature.

14.2.1 Life, Health, and Safety

Overall Population

The entire population of Sussex County (144,221) is vulnerable to infestations. The population living near waterbodies is at risk for exposure to HABs as well as those that use those waterbodies for recreation, fishing, and water supply.

Socially Vulnerable Population

The costs associated with removing or treating impacted vegetation may not be feasible to populations with limited incomes. Infestations can impact potable water sources – including wells and treatment facilities. The cost of finding access to potable water that is not contaminated (such as private water sources or bottled water) may not be financially available to socially vulnerable populations. Non-English speaking populations may struggle understanding the risks associated with infestations if education and outreach are not provided in preferred languages; many outreach materials are generated only in English.

Without a quantitative assessment of potential impacts of an infestation on socially vulnerable populations, the Planning Partners can best assess mitigation options through an understanding of the general numbers and locations of such populations across Sussex County. Section 3.5.3 provides detailed data on socially vulnerable populations within the planning area. Table 14-3 summarizes highlights of this information. For planning purposes, it is reasonable to assume that percentages and distribution of socially vulnerable populations affected by infestations will be similar to the countywide numbers.

Table 14-3. Distribution of Socially Vulnerable Populations by Municipality

Category	Sussex County Total		Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent	Number	Percent
			Vernon (T)	Walpack (T)	Walpack (T)	Sparta (T)
Population Over 65	**25,451**	**17.65%**	**3,687**	**100.00%**	**7**	**13.38%**
			Sparta (T)	Lafayette (T)	Walpack (T)	Walpack (T)
Population Under 5	**6,500**	**4.51%**	**1,160**	**7.21%**	**0**	**0.00%**
Non-English-Speaking Population	**1,922**	**1.33%**	Hopatcong (B) **339**	Hamburg (B) **10.17%**	Andover, Frankford, Sandyston, Stanhope, Stillwater, Walpack **0**	Andover, Frankford, Sandyston, Stanhope, Stillwater, Walpack **0.00%**
Population With Disability	**15,697**	**10.88%**	Vernon (T) **2,318**	Franklin (B) **17.32%**	Walpack (T) **0**	Walpack (T) **0.00%**
Population Below Poverty Level	**7,320**	**5.08%**	Vernon (T) **877**	Sussex (B) **18.03%**	Walpack (T) **0**	Walpack (T) **0.00%**
Households Below ALICE Threshold	**14,428**	**21%**	Vernon (T) 1,833	Sussex (B0 **48%**	Branchville (B) 90	Green (T) **14%**

14.2.2 General Building Stock

Structures are not directly affected by infestations. However, the EAB and hemlock woolly adelgid may cause a loss of trees throughout the County, which could result in stream bank instability, erosion, and increased sedimentation, impacting ground stabilization and possibly causing foundation issues for nearby structures. With an increased number of dead trees, there is an increased risk of trees falling on roadways, power lines, or buildings, and an increase in fuel source for wildfires to spread.

14.2.3 Community Lifelines and Other Critical Facilities

Community lifelines could experience the same impacts of infestation related to tree loss as the general building stock. Water that becomes polluted due to increased sedimentation and erosion will require additional treatment.

HABs can lead to shutdowns of water intakes from surface waters that are impacted by blooms and their toxins. The EPA has assessed the effectiveness of treatment options that water treatment plants can employ to address the risks presented by HABs. Applying the wrong treatment process can damage the facility and release cyanotoxins rather than remove them (United States Environmental Protection Agency 2014).

14.2.4 Economy

Farmers may lose revenue because of crop losses from infestations. The New Jersey Department of Agriculture has indicated that New Jersey farmers lose $290 million annually in direct crop loss or damage caused by agricultural pests (State of New Jersey 2019). This impacts the livelihood of farmers as well as the community that relies on these crops for food or other commodities. In 2017, there were 25,671 acres of cropland in Sussex County, and 20,441 acres that was harvested. Revenues for Sussex County from crop sales and livestock stocks sales were

approximately $10.8 million and $7.4 million, respectively (United States Department of Agriculture 2017). Therefore, it is reasonable to believe that Sussex County farmers have experienced monetary losses from infestations. There are no specific estimates on the economic impact of the spotted lanternfly, but it is assumed to be high because this insect feeds in large numbers that can quickly cause damage.

The New Jersey Forest Service has indicated that 9 percent of New Jersey forests are susceptible to EAB attacks. EAB can infect nursery stock and mature trees, which could reduce the timber value of hardwood exports (New Jersey Department of Agriculture 2016). In 2009, the USDA conducted computer simulations of EAB spread to estimate the cost of ash tree treatment, removal, and replacement between 2009 and 2019. The simulations predicted an EAB infestation covering 25 states, and assumed treatment, removal, and replacement of more than 17 million ash trees on developed land within established communities. The total costs were estimated at $10.7 billion. This figure doubled when the model was reset to include developed land outside, as well as inside, human communities (Kovacs, et al. 2009).

HAB-related economic impacts on Sussex County are largely associated with the agricultural and recreation sectors. News of a closure of a body of water can result in visitors avoiding the area. Even after closures are lifted, negative public reaction can persist and continue to impact local revenue and property values. The cost of programs to monitor HABs and implement alerts depends on the extent of the blooms. Additional costs may include money spent on nutrient reduction programs for agricultural commodities, purchasing backup water sources, and costs to implement advanced drinking water treatment. Agricultural producers may need to develop better strategies to reduce the nutrient runoff that causes HABs, which may increase production costs for their commodities and overall costs for their buyers.

14.2.5 Natural, Historic and Cultural Resources

Natural

Sussex County's parks, forests and neighborhood trees are vulnerable to infestations. The New Jersey Forest Service has indicated that EAB will first infest the top of the tree's crown. This leads to the crown dying, bark splitting, and exit holes on lower parts of the tree. Trees that are infested only live on average of 3 to 4 years (New Jersey Department of Agriculture 2016).

Species that cause eventual destabilization of soil, such as invasive insects that destroy plants, can increase runoff into waterbodies. Soil destabilization can increase the likelihood of mudslides in areas with a steep slope. It also can lead to increased HABs, which can release toxins that can kill fish and invertebrates. Animals that prey on fish and invertebrates in surface waters, such as birds and mammals, may be affected if they ingest impacted prey (Centers for Disease Control and Prevention 2022). Algal blooms can have drastic impacts on oxygen levels in surface waters. When algae begin to die off following a bloom, bacteria begin to decompose the organic material. This decomposition consumes dissolved oxygen and releases carbon dioxide. If the bloom and die off is large enough, dissolved oxygen levels in aquatic systems can rapidly crash. Low-oxygen conditions connected to algal blooms have resulted in large fish and invertebrate kills (National Oceanic and Atmospheric Administration 2023).

Historic

Infestations are unlikely to have direct impacts on historic resources. However, indirect impacts such as damage from falling trees and other cascading impacts discussed above may impact historic resources.

Cultural

Infestations have little to no impact on cultural resources though nuisance impacts such as increased deer and geese droppings in recreational areas may occur. In some cultures, trees are seen as symbolic beings; these trees may be impacted if the species is a desired food source for insect pests.

14.3 CHANGE OF VULNERABILITY SINCE 2021 HMP

Overall, the County continues to remain vulnerable to the infestation and invasive species hazard. Any perceived or actual changes in vulnerability may be attributed to changes in population numbers and density.

14.4 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

14.4.1 Potential or Planned Development

Changes in land use could render some habitats more susceptible to invasive species, such as clearing the land and providing opportunities for invasive species to inhabit the area. Clearing the land may also reduce the habitat for predator species that could manage the spread of infestations naturally. As increased development is often associated with stormwater and runoff issues, HABs may become more likely in areas of increased development. Expected areas of development are indicated in the jurisdictional annexes in Volume II of this plan.

14.4.2 Projected Changes in Population

Any changes in the density of population near waterbodies can impact the number of persons exposed to HABs. Infestation of cropland and nurseries can also have an impact on persons outside of Sussex County if the farmers within the County supply resources to neighboring communities. Trends occurring around the County may mean that infestations of agricultural commodities provided by the County impact a greater number of persons.

The New Jersey Department of Labor and Workforce Development produced population projections by County from 2014 to 2019, 2024, 2029, and 2034. According to these projections, Sussex County is projected to have a decrease in population in the upcoming years. These projection totals include a population of 140,400 by 2024, 137,300 by 2029, and 136,600 by 2034 (State of New Jersey 2017).

14.4.3 Climate Change

Changing weather patterns could create a change in the migration patterns of pest species into and out of Sussex County. If the species have a more prolonged existence in the County, there may be a greater number of infestation events and a higher value of resulting losses. Warmer temperatures could increase the likelihood of HABs. Increased alternation of drought and heavy precipitation could result in additional nutrient runoff into waterbodies, providing more fuel for HABs. Higher carbon dioxide levels in the atmosphere and surface waters could create a more favorable growing environment for HABs (United States Environmental Protection Agency 2022).