



5.4.3 INFESTATION

This section provides a profile and vulnerability assessment for the infestation hazard.

5.4.3.1 Hazard Profile

This section provides profile information including description, location and extent, previous occurrences and losses and the probability of future occurrences.

Description

An infestation is defined as a state of being invaded or overrun by parasites that attack plants, animals and humans. Insect, fungi and parasitic infestations can result in destruction of various natural habitats and cropland, impact human health, and cause disease and death among native plant, wildlife and livestock. An infestation is the presence of a large number of pest organisms in an area or field, on the surface of a host, or in soil. They result from when an area is inhabited or overrun by these pest organisms, in numbers or quantities large enough to be harmful, threatening or obnoxious to native plants, animals and humans. Pests are any organism (insects, mammals, birds, parasite/pathogen, fungi, non-native species) that are a threat to other living species in its surrounding environment. Pests compete for natural resources or they can transmit diseases to humans, crops and livestock. Human populations are generally impacted by insect or animal infestations that can result in health impacts and can lead to potential epidemics or endemics.

New York State has been impacted by various past and present infestations including: Asian Longhorned Beetles, woolly adelgid species (balsam and hemlock), siren woodwasp, Emerald Ash Borer, and the gypsy moth. A majority of these insects are found within Warren County with the exception of Asian Longhorned Beetle, Emerald Ash Borer and hemlock woolly adelgid. However, the insects not currently found in the County are considered species of concern that have the potential of impacting Warren County. For the purpose of this HMP Update, these species will be discussed further.

Asian Longhorned Beetle

The Asian Longhorned Beetle (ALB) is a wood-boring beetle believed to have been introduced into the United States on wood pallets and wood packing material in cargo shipments from Asia. ALB larvae bore through wood of numerous hardwood species that include maples, elm, horsechestnut, willow, sycamore, and birch. ALB boring physically weakens the trees and disrupts sap flow. It was first discovered in the United States in 1996 on several hardwood trees in Brooklyn, New York. Currently, ALB is not found in Warren County; however, it is a species of concern for the County and the surrounding area and it is impacting surrounding areas.

Balsam Woolly Adelgid

The balsam woolly adelgid, *Adelges piceae* (Ratzeburg), is a tiny sucking insect that was introduced into North America from Europe. It first entered in the northeastern United States and southeastern Canada around 1900. This insect infects and kills fir trees, with North American species being the most sensitive to attack. As the adelgids feed on the bark of stems, they release toxins contained in their saliva. These toxins severely weaken the tree, affecting development and growth. Extensive tree mortality has occurred in the southeast and northwest United States. Currently, balsam woolly adelgid is not found in Warren County; however, it is a species of concern for the County and the surrounding area.

Hemlock Woolly Adelgid

The hemlock woolly adelgid (*Adelges tsugae*) is native to parts of Asia and was first discovered in New York in 1985. The adelgid uses long mouth parts to extract sap and nutrients from hemlock foliage, which prevents free



growth and causes needles to discolor from deep green to grayish green, and to drop prematurely. The loss of new shoots and needles seriously impairs tree health. Infestation is usually fatal to the host after several years. From the first discovery of the hemlock woolly adelgid in the Hudson Valley in the 1980's, the insect has spread north and west to the Catskills, the Capital Region and even the Finger Lakes and other parts of Western New York. Currently, 25 counties in New York State are infested with the hemlock woolly adelgid. Currently, hemlock woolly adelgid is not found in Warren County; however, it is a species of concern for the County and the surrounding area.

Sirex Woodwasp

Sirex woodwasp is a Eurasian native, which was first discovered in New York State in 2005. This was the first North American discovery of this exotic, invasive pest that is one of the top 10 most serious forest insect pest invaders worldwide. Native woodwasps utilize dead and dying pines, whereas the invasive sirex woodwasp attack healthy pines as well. Pines, with a diameter of six inches or greater, are susceptible; however, stressed, suppressed, and crowded pines are favored by the sirex woodwasp (NYIS, 2013). All pine species are believed to be at risk, particularly stressed Scots (or Scotch), red and eastern white pines (NYSDEC, 2013). Sirex woodwasp has been identified in Warren County and is a species of concern for the County and the surrounding area (Adirondack Park Invasive Plant Program 2016).

Emerald Ash Borer

Emerald Ash Borer (EAB) was first discovered in the United States in 2002 in southeastern Michigan. This Asian beetle infests and kills North American ash species, including green, white, black and blue ash; making all native ash trees susceptible to this insect. The insect are typically present from late May through early September and are 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 emerald ash borer is responsible for the destruction of over 50 million ash trees in the United States since its discovery in Michigan. Currently, EAB is not found in Warren County; however, it is a species of concern for the County and the surrounding area.

Gypsy Moth

The gypsy moth (*Lymantria dispar*) is a non-native insect from France. Its caterpillar (larva) stage eats the leaves of a large variety of trees. A sample of some of the many species it eats includes oak, maple, apple, crabapple, aspen, willow, birch, mountain ash, pine and spruce. The populations of gypsy moths rise and fall in cycles. When populations are high, thousands of acres of trees can be damaged. Even though they do not pose a major threat to trees in New York State, gypsy moths are not native and their populations can reach high, destructive (outbreak) levels (NYSDEC 2016).

Extent and Location

The presence of invasive and nuisance species have been reported throughout New York State and Warren County. Information regarding the extent and location of these species is further discussed below.

Asian Long-horned Beetles (ALB)

Although it is believed that this beetle arrived in the U.S. between the 1980's and 1990's, the ALB was first discovered in McCarren Park of Greenpoint, Brooklyn on August 19, 1996 and soon after in Amityville, Long Island in September 1996. Since then, infestations were found in and around New York City, including on Long Island, Manhattan, Queens and Flushing Park. At present, it has been found in several areas in New York City and Long Island, the Chicago area (the quarantine having been lifted on July 12, 2006), New Jersey, and Toronto,



Canada. Additionally, the USDA’s Animal and Plant Health Inspection Service (APHIS) detected ALB in 26 warehouses and residential sites in 14 states. This detection led to actions that prevented the ALB from getting outdoors.

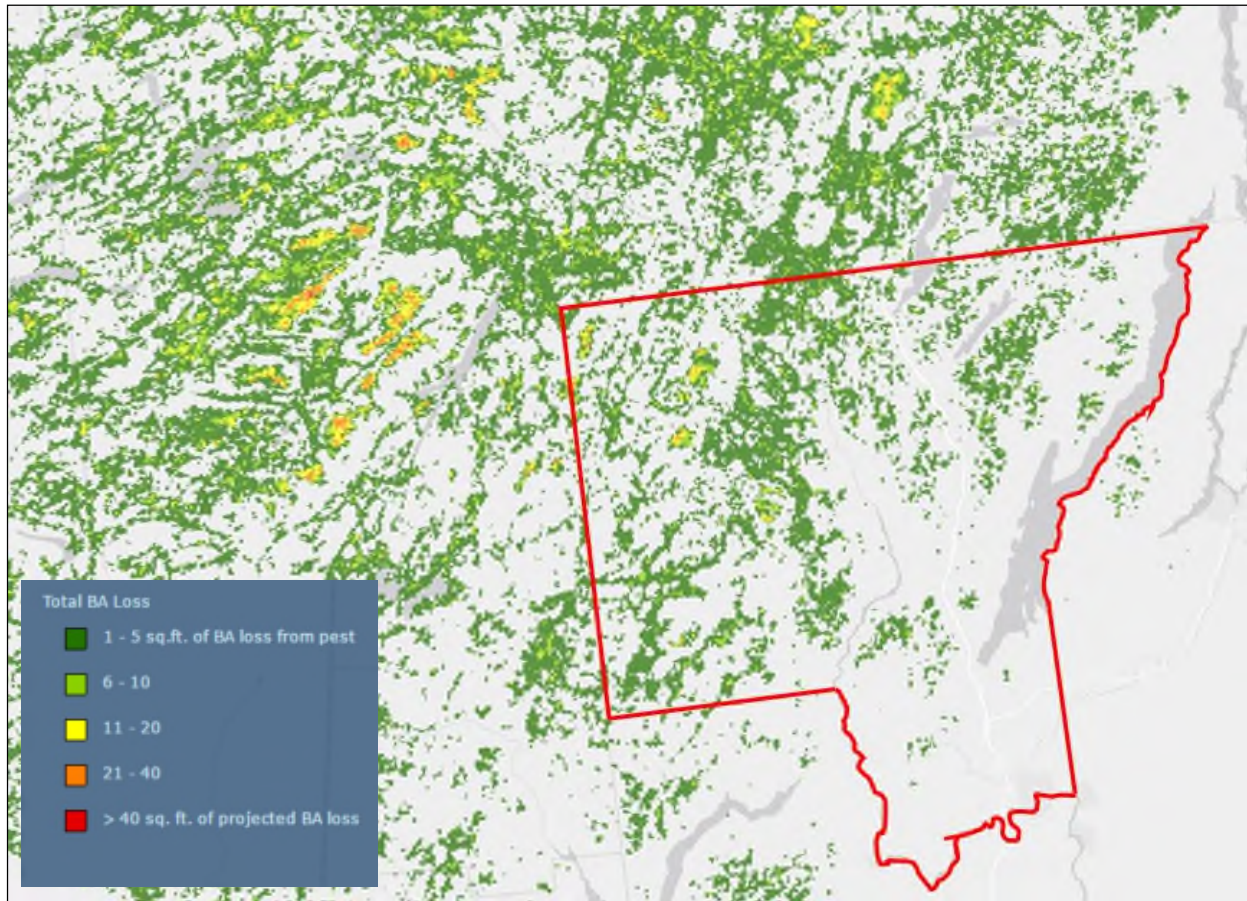
The USDA-APHIS Plant Protection and Quarantine (PPQ) has implemented quarantine and control strategies and restrictions in New York State, Illinois, and New Jersey that seek to eradicate this serious pest from the U.S. Quarantine areas have been established where beetles or their damage have been found, as a legal measure taken by a state or federal agency to prohibit the spread of a pest from one area to another. Code of Federal Regulations (e-CFR), Title 7: Agriculture, PART 301—Domestic Quarantine Notices, have been developed by the USDA-APHIS for handling wood and planting trees in these ALB quarantine zones. The Nature Conservancy has indicated that if ALBs were to break out of the established quarantine areas and spread into upstate New York State and New England, they could cause a devastating economic blow to the sugar maple, tourism, timber, and forest product industries. Over 1.5 billion trees are susceptible across New England (The Nature Conservancy, 2007). Quarantine zones in New York State have been limited to New York City and Long Island; there have been none in Warren County.

Balsam Woolly Adelgid

Balsam woolly adelgid infest and kill fir trees and the North American species of fir are the most sensitive to attack. According to the Adirondack Park Invasive Plant Program (APIPP) - <http://adkinvasives.com/>, balsam woolly adelgid is found within Warren County. As illustrated in Figure 5.4.3-1, the County has experienced losses from the impacts of balsam woolly adelgid. For those areas in the County impacted by balsam woolly adelgid, most saw one to five square feet of loss to balsam trees from this pest. A majority of losses occurred in the Adirondack State Park.



Figure 5.4.3-1. Total Loss from Balsam Woolly Adelgid



Source: USDA 2015

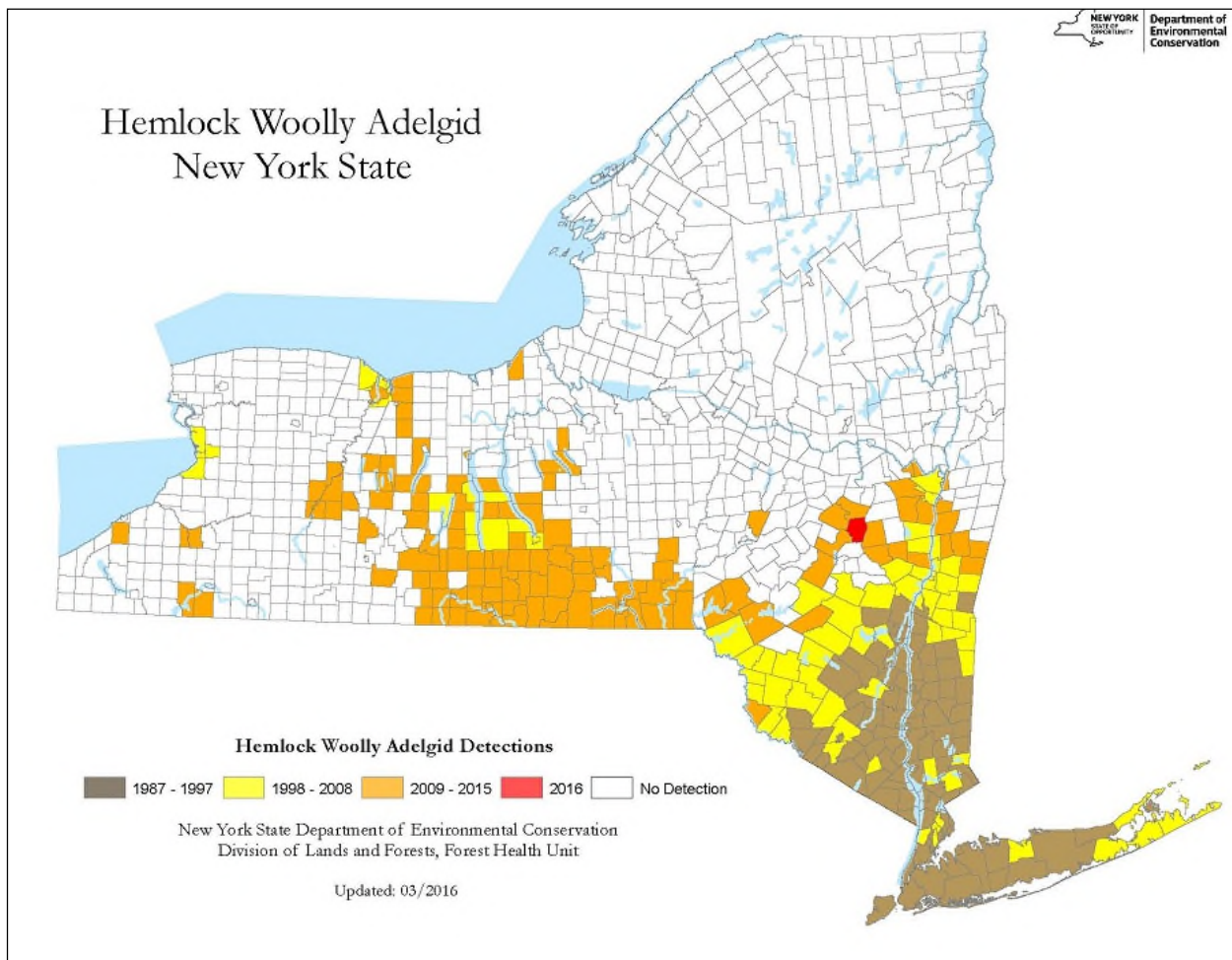
Note: Warren County is outlined in red.

Hemlock Woolly Adelgid

From the first discovery of the hemlock woolly adelgid in the Hudson Valley in the 1980's, the insect has spread north and west to the Catskills, the Capital Region and even the Finger Lakes and other parts of Western New York. Currently, 25 New York counties are infested with the hemlock woolly adelgid. Warren County has not had any detections of hemlock woolly adelgid; however, infestation of this insect is spreading throughout the State and the County has the potential to be impacted in the future.



Figure 5.4.3-2. Hemlock Woolly Adelgid in New York State



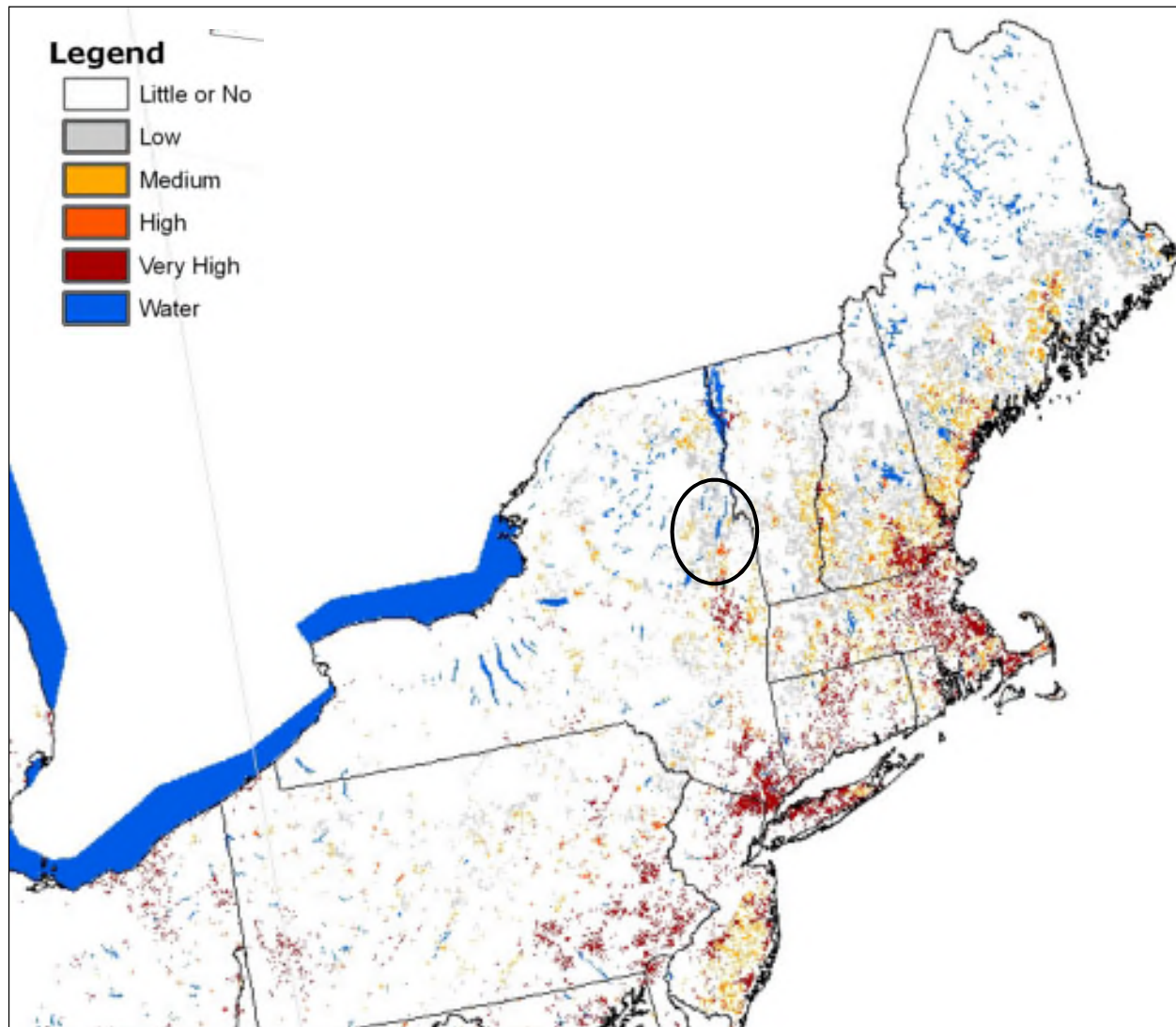
Source: NYSDEC 2015

Sirex Woodwasp

The species is native to Europe, Asia, and North Africa. It can now be found within the northeast United States ranging from Michigan to New Hampshire. In New York State, the largest damage is being seen in plantation Scots, Austrian, and red pine. These plantations were planted in the early to mid-20th century and were often unmanaged. Now, they are crowded, stressed and underperforming. According to the U.S. Forest Service, Warren County has low to high susceptibility potential of a Sirex woodwasp infestation (NYIS 2013). Figure 5.4.3-3 displays Sirex Woodwasp susceptibility in the northeast United States.



Figure 5.4.3-3. Sirex Woodwasp Susceptibility in the Northeast U.S.



Source: USDA Forest Service, 2006

Note: The black circle indicates the approximate location of Warren County.

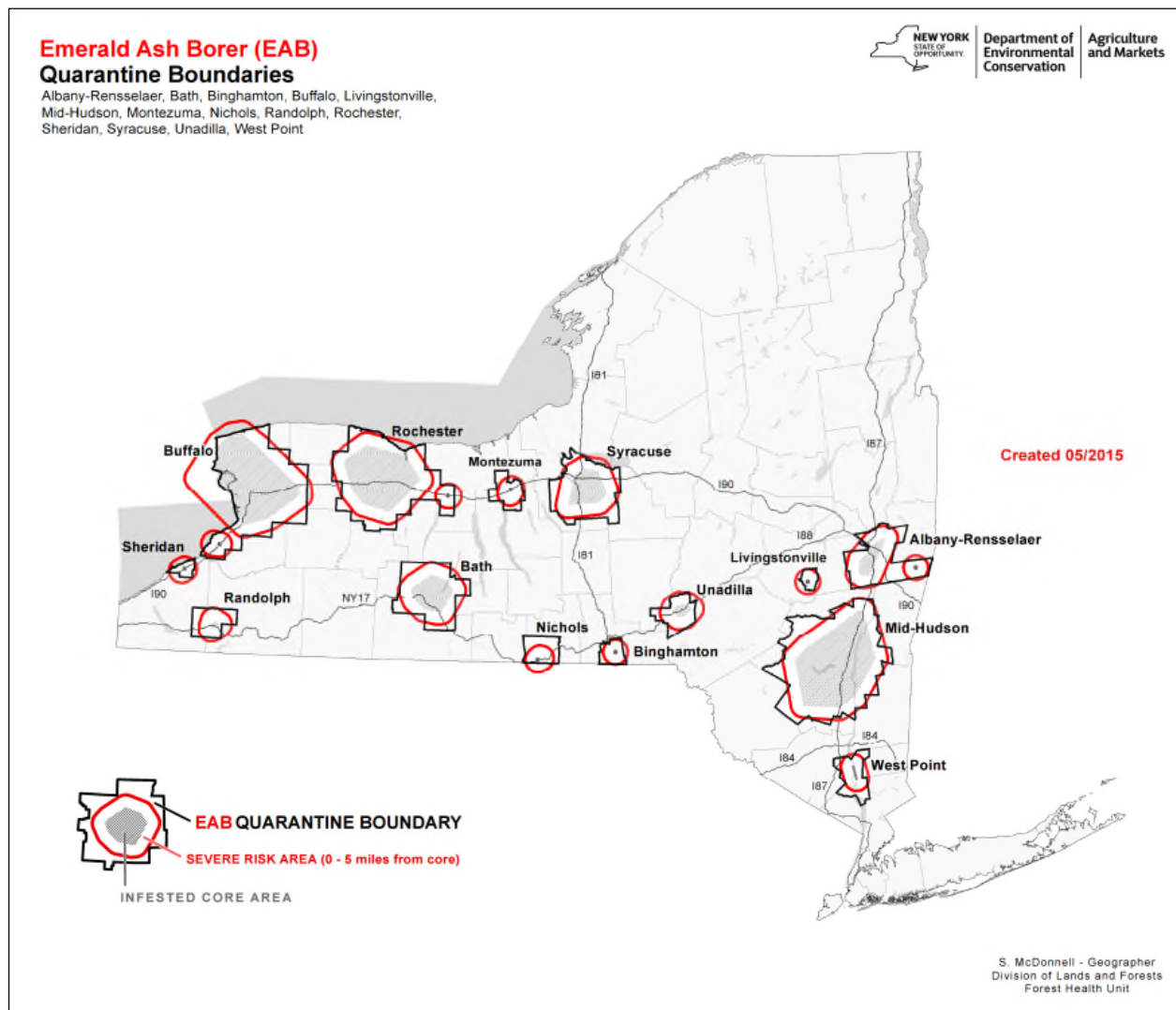
Emerald Ash Borer

As of early 2015, EAB has been confirmed in 24 states, including New York State, and in two Canadian provinces. It has killed millions of ash trees in southeastern Michigan along and tens of millions more in the infested states. EAB caused regulatory agencies and the USDA to enforce quarantines and fines to prevent potentially infested ash trees, logs or hardwood firewood from moving out of areas where EAB is found.

Figure 5.4.3-4 shows the location of the quarantine areas of New York State. The figure shows that Warren County is not in a quarantine area; however, ash trees are found in the County and has the potential of being impacted by EAB in the future.



Figure 5.4.3-4. Emerald Ash Borer Quarantine Areas in New York State



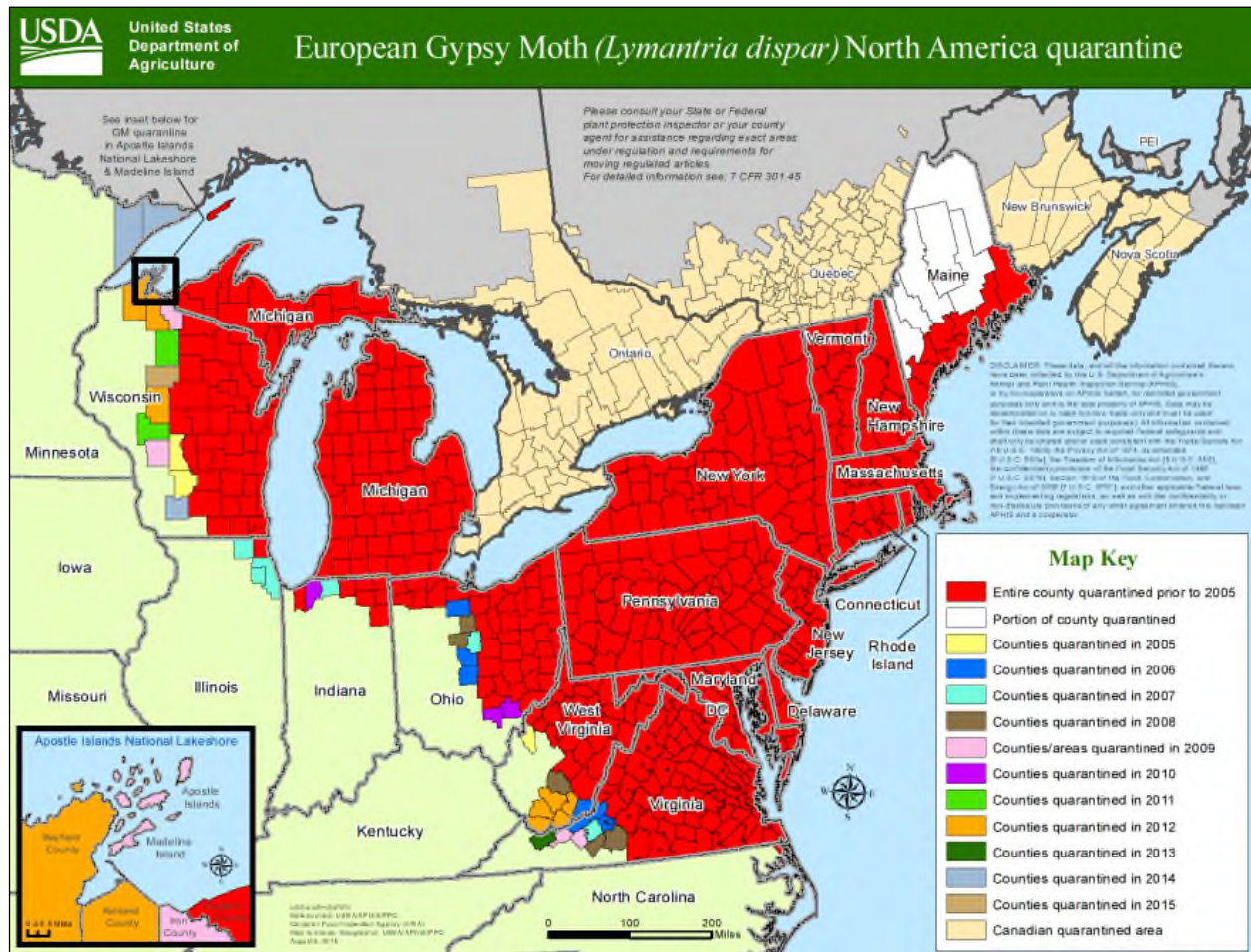
Source: NYSDEC 2015

Gypsy Moth

The gypsy moth is a significant non-native forest pest in the United States. The USDA as a gypsy moth program that regulates the movement of gypsy moth host material from infested areas to other areas of the country. This program is a federal-state partnership that prevents the establishment of gypsy moths in areas of the United States that are not contiguous to current regulated states and counties. Figure 5.4.3-5 illustrates the quarantine areas of the United States. Warren County is located within a gypsy moth quarantine area.



Figure 5.4.3-5. Gypsy Moth Quarantine Areas in the United States



Source: USDA 2015

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with infestation events throughout New York State and Warren County. With so many sources reviewed for the purpose of this HMP, loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP.

Between 1953 and 2016, New York State has not been included in infestation-related FEMA emergency or major disaster declarations (FEMA 2016).

Based on all sources researched, Warren County is currently impacted by balsam woolly adelgid, sirex woodwasp and the gypsy moth. However, specific occurrences and losses were not identified for these infestations in the County.

Probability of Future Events

Based on historical documentation, increased incidences of infestation throughout New York and the overall impact of changing climate trends, it is estimated that Warren County and all its jurisdictions will continue to experience infestation events that may induce secondary hazards and health threats to the County population if





infestations are not prevented, controlled or eradicated effectively. The Planning Committee views this as a “Frequent” hazard of concern (hazard event that occurs more frequently than once in 25 years) (see Table 5.3-3 in Section 5.3).

Climate Change Impacts

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State’s vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA], 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Warren County is part of Region 7 (see Figure 5.4.3-6), Adirondack Mountains. Some of the issues in this region, affected by climate change, include: loss of high elevation plants, animals and ecosystem types; decline in winter recreation; decline in milk production, etc. (NYSERDA 2011).

Figure 5.4.3-6. Climate Regions of New York State



Source: NYSERDA 2011



Temperatures in New York State are warming, with an average rate of warming over the past century of 0.25° F per decade. Average annual temperatures are projected to increase across New York State by 2° F to 3.4° F by the 2020s, 4.1° F to 6.8° F by the 2050s, and 5.3° F to 10.1° F by the 2080s. By the end of the century, the greatest warming is projected to be in the northern section of the State (NYSERDA 2014).

Regional precipitation across New York State is projected to increase by approximately one to eight-percent by the 2020s, three to 12-percent by the 2050s, and four to 15-percent by the 2080s. By the end of the century, the greatest increases in precipitation are projected to be in the northern areas of the State (NYSERDA 2014).

In Region 7, it is estimated that temperatures will increase by 3.7°F to 7.4°F by the 2050s and 4.2°F to 11.8°F by the 2080s (baseline of 39.9°F). Precipitation totals will increase between 2 and 15% by the 2050s and 3 to 17% by the 2080s (baseline of 40.8 inches). Table 5.4.3-1 displays the projected seasonal precipitation change for the Adirondack Mountains ClimAID Region (NYSERDA, 2011).

Table 5.4.3-1. Projected Seasonal Precipitation Change in Region 7, 2050s (% change)

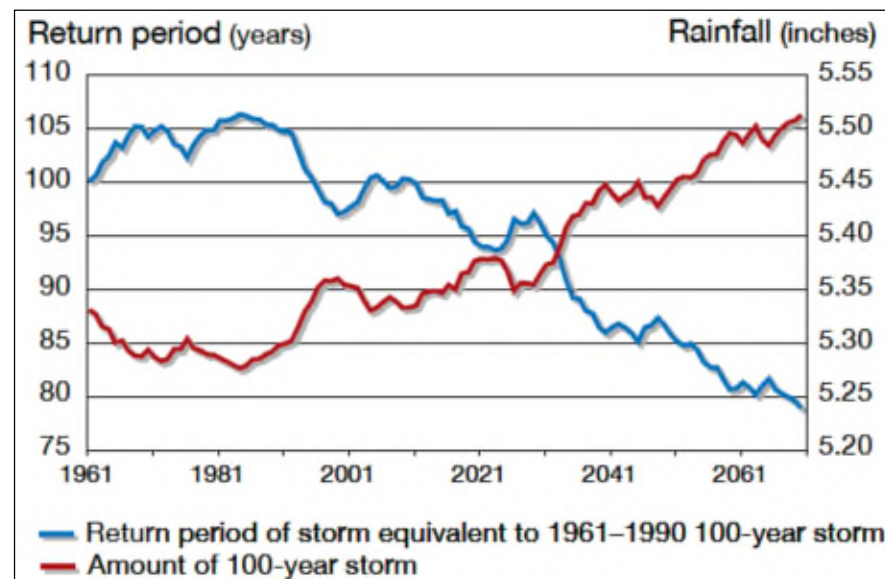
Winter	Spring	Summer	Fall
+5 to +15	-5 to +10	-5 to +5	-5 to +10

Source: NYSEDA 2011

The projected increase in precipitation is expected to fall in heavy downpours and less in light rains. The increase in heavy downpours has the potential to affect drinking water; heighten the risk of riverine flooding; flood key rail lines, roadways and transportation hubs; and increase delays and hazards related to extreme weather events (NYSERDA 2011). Less frequent rainfall during the summer months may impact the ability of water supply systems. Increasing water temperatures in rivers and streams will affect aquatic health and reduce the capacity of streams to assimilate effluent wastewater treatment plants (NYSERDA 2011).

Figure 5.4.3-7 displays the project rainfall and frequency of extreme storms in New York State. The amount of rain fall in a 100-year event is projected to increase, while the number of years between such storms (return period) is projected to decrease. Rainstorms will become more severe and more frequent (NYSERDA 2011).

Figure 5.4.3-7. Projected Rainfall and Frequency of Extreme Storms



Source: NYSEDA 2011



Total precipitation amounts have slightly increased in the northeast United States, by approximately 3.3 inches over the last 100 years. There has also been an increase in the number of two-inch rainfall events over a 48-hour period since the 1950s (a 67-percent increase). The number and intensity of extreme precipitation events are increasing in New York State as well. More rain heightens the danger of localized flash flooding, streambank erosion and storm damage (DeGaetano et al [Cornell University], 2011).

With the projection of temperature and rainfall increase due to climate change, there is evidence that climate change may be a factor in the expansion of infectious diseases in the U.S. Mosquitos capable of carrying and transmitting diseases now live in at least 28 states. As temperatures increase and rainfall patterns change, these insects can remain active for longer seasons and in wider areas. Lyme disease could expand throughout the United States and northward into Canada, as temperatures warm, allowing ticks to move into new regions. Warmer temperatures, heavy rainfall and high humidity have reportedly increased the rate of human infection of WNV (Natural Resources Defense Council 2013).



5.4.3.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For infestation, Warren County has been identified as the hazard area. Therefore, all assets in Warren County, as described in the County Profile section, are vulnerable to infestation. The following text evaluates and estimates the potential impact of infestation on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Infestation is a significant concern to Warren County, mainly due to its impact on public health and natural resources. Estimated losses are difficult to quantify; however infestation can impact Warren County's population and economy. Direct impacts of infestation have cascading indirect impacts. As vegetation dies or becomes stressed/weakened by pests such as balsam woolly adelgid or sirex woodwasp, there is an increase in available fuel and increase in high intensity wildfires. As species composition changes due to infestation outbreaks, whole fire regimes can shift. Physical stresses on trees may also affect how street trees respond to physical stresses caused by other natural hazards such as hurricanes, drought and ice storms (Kurtz, 2007).

Data and Methodology

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.

Impact on Life, Health and Safety

The entire population of Warren County is vulnerable to infestation.

Impact on General Building Stock and Critical Facilities

No structures are anticipated to be directly affected by infestation.

Impact on Economy

The impact infestation has on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with the activities and programs implemented to conduct surveillance and address infestation have not been quantified in available documentation. Instead, activities and programs implemented by the County to address this hazard are described below, all of which could impact the local economy.

Impact of Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the infestation hazard because the entire planning area is exposed and vulnerable.



Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New York State, Warren County, and local efforts.