



5.4.6 INVASIVE SPECIES AND INFESTATION

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

5.4.6.1 Hazard Profile

This section provides profile information including description, extent, location, previous occurrences and losses and the probability of future occurrences. For the purpose of this HMP update, this profile includes information related to invasive plants and animals and insect-borne diseases.

Description

According to the New York State Department of Environmental Conservation, invasive species are non-native species that can cause harm to the environment, to the economy, or to human health (NYSDEC 2018). Invasive species originate in many parts of the world and can be found in the form of aquatic or terrestrial species. Invasive species are one of the greatest threats to New York State's biodiversity. They can cause or contribute to:

- Habitat degradation and loss
- The loss of native fish, wildlife and tree species
- The loss of recreational opportunities and income
- Impact water quality
- Crop damage and diseases in humans and livestock
- Risks to public health and safety (NYSDEC 2018).

According to the New York iMapInvasives online database, Onondaga County, a total of 150 invasive species (plants, animals, and insects) have been observed in the County (New York iMapInvasives 2018) including both aquatic and terrestrial plants and animals. The Cornell Cooperative Extension (CCE) in Onondaga County provides information regarding numerous invasive and nuisance species in the County but does not address aquatic invasive species. The following is a list of invasive aquatic and terrestrial plants and animals identified as being concerns for Onondaga County by iMapInvasives and the Steering Committee due to current presence in the county or due to the risk of spreading into Onondaga County from neighboring counties:

- Aquatic plants – Water Chestnut, Eurasian Watermilfoil, Flowering Rush, Fanwort, Brittle Naiad, Watercress, Starry Stonewort, Curly Pondweed, and Hydrilla
- Aquatic animals - Asian Carp, Asian Clam, Asian Shore Crab, Chinese Mystery Snail, Fishhook Waterflea, Northern Snakehead Fish, Quagga Mussel, Round Goby, Sea Lamprey, Spiny Water Flea, and Zebra Mussels
- Terrestrial animals – Armyworm, Asian Longhorned Beetle, Brown Marmorated Stink Bug, Emerald Ash Borer, and Hemlock Woolly Adelgid
- Terrestrial plants - Common Buckthorn, Common Reed (*Phragmites australis*), Exotic Bush Honeysuckles, Garlic Mustard, Giant Hogweed, Japanese Barberry, Japanese Knotweed, Japanese Stilt grass, Multiflora Rose, Oriental Bittersweet, and Swallow-Worts

In addition to invasive species, Onondaga County identified the infestation of ticks and mosquitos as a concern due to the diseases they can carry and the spread of those diseases throughout the County. While a majority of the insects that cause the diseases are native to Onondaga County, the Steering Committee felt it was important to include as they pose similar risks as invasive species.



The list of invasive species in the region is expansive and constantly changing. For the purpose of this HMP Update and as identified by the Steering Committee, the following invasive species and infestations will be discussed as they are considered to be the primary species of concern at the time of this plan update: Emerald Ash Borer, Hemlock Woolly Adelgid, Common Reed, Eurasian Watermilfoil, Water Chestnut, tick-borne diseases, and mosquito-borne diseases.

Emerald Ash Borer



Source: NYIS (2019)

the United States since its discovery in Michigan (NYSDEC 2019a). Ash trees have previously been decimated by Dutch Elm Disease and few are likely to survive EAB infections unless treated with pesticide (Onondaga County Ash Tree Management Strategy 2014).

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 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 emerald ash borer is responsible for the destruction of over 50 million ash trees in

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 (NYSDEC 2019b). It has been identified in the southwestern portions of Onondaga County.



Source: NYIS (2019)

True Armyworm

True Armyworm (*Pseudaletia unipuncta*), also known as the common armyworm, is primarily a pest of plants in the grass family: forage/ pasture/ grasses and lawns, small grains, and corn. Young larvae appear smooth, cylindrical, pale green to brownish, while mature larvae are smooth and marked with two orange, white-bordered strips on each side. Larvae range in size from 1/8 inch to 1 1/2 inches long. The insect spends winters in the south and flies up to New York State in the spring (Cornell Cooperative Extension 2015).



Common Reed (*Phragmites*)



Source: NYIS (2019)

Common reed (*Phragmites australis*) or *Phragmites* can quickly form dense stands of stems which crowd out or shade native vegetation in inland and estuary wetland areas. It alters habitats by changing marsh hydrology; changing local topography; increasing brushfire potential; and outcompeting native plants above and belowground. *Phragmites* also produces mesoxalic acid, which is a toxin harmful to many plants (Syracuse Post Standard 2018; New York Invasive Species Information 2019). The loss of native plant species can have staggering impacts on native fauna that rely on native vegetation for a source of food and shelter, and also can impact biodiversity, water, soil quality, and resilience, resulting in the potential loss of entire ecosystems.

Eurasian Watermilfoil

Eurasian watermilfoil is the most common and widely distributed aquatic invasive plant in New York State. It can be found in all watersheds in the state, including Onondaga County (NYSDEC 2019c). It is a submersed aquatic plant that roots at the lake bottom and grows rapidly, creating dense beds and canopies. It is highly invasive and competes aggressively with native aquatic plants, thereby reducing diversity. Milfoil beds are poor fish spawning areas, and excessive cover can lead to populations of stunted fish. Dense surface mats can also interfere with boating, fishing, swimming, and other recreational water activities (Adirondack Watershed Institute 2018).



Source: Minnesota Sea Grant (2019)

Water Chestnut



Source: NYIS (2019)

Water chestnut is an aquatic invasive plant that is native to Eurasia and Africa; it was introduced in the United States in the mid-1800s as an ornamental plant. This plant spreads by rosette and fruits detaching from the stem and floating to other areas. They can also cling to floating objects such as boats, pads of boat trailers, and fishing equipment. Water chestnuts form dense mats of rooted vegetation and make it difficult to boat, kayak, canoe, or swim. The dense mats of water chestnuts shade out native aquatic plants that provide food and shelter to native fish, birds, and insects. Additionally, decomposition of these dense mats reduces dissolved

oxygen levels and can lead to death of fish.

Tick-Borne Diseases

Tick-borne diseases are bacterial or viral illnesses that spread to humans through infected ticks. Ticks become infected by microorganisms when feeding on small infected mammals (e.g., mice and voles). The most common tick-borne diseases found in New York State include: Lyme disease, Ehrlichiosis, Anaplasmosis, Rocky Mountain spotted fever, and Babesiosis. The native species of ticks found in New York State that may carry disease-causing micro-organisms are the deer tick, lone star tick, and the American dog tick. Other species such



as the longhorned tick may soon spread into the county. Tick-borne diseases are a major concern for Onondaga County.

Lyme Disease

Lyme Disease is currently the most common tick-borne disease in Onondaga County. 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 York State, the most commonly infected tick is the deer tick (CCE 2019). Deer ticks have become a huge concern for Onondaga County residents because of this.

Mosquito-Borne Diseases

Mosquito-borne diseases are bacterial illnesses that spread to humans through infected female mosquitoes. Diseases of concern to Onondaga County include West Nile Virus (WNV) and Eastern Equine Encephalitis Virus (EEE). Various mosquito species are present in Onondaga County which are known to transmit various pathogens including West Nile Virus.

West Nile Virus

WNV is a mosquito-borne virus that is spread to humans by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Most people infected by WNV have no symptoms or mild flu-like symptoms (NYSDOH 2015). A small percentage of people infected with WNV will develop encephalitis (inflammation of the brain) or meningitis (inflammation of the lining of the brain and spinal cord). There is no human vaccine commercially available (Onondaga County Health Department 2019).

Since 2000, WNV has been well established throughout Onondaga County and it is considered endemic in the environment. The principal mosquito vector for WNV are members of the *Culex* species that are typically abundant in urban areas, breeding easily in artificial containers such as birdbaths, discarded tires, buckets, clogged gutters, catch basins, and other standing water sources. However, WNV has also been found in several other species of mosquitoes in the county. Mosquitoes with WNV have been found in the county consistently each year since 2000 and 22 human cases have been confirmed (Onondaga County Health Department 2019).

Eastern Equine Encephalitis

EEE is a mosquito born virus that is spread to humans by the bite of an infected mosquito. Similar to WNV, EEE is maintained by a cycle of transmission between mosquitoes and birds. EEE in humans is rare and either results in a systemic infection that has flu-like symptoms or the more serious encephalitis. Approximately one third of all people who contract the disease will die while most survivors suffer brain damage. There is no human vaccine commercially available; however there is an equine vaccine.

EEE has been found in the mosquitoes in Onondaga County since the early 1970s. The virus is usually found in the mosquito species *Culiseta melanura*, a type of mosquito that typically breeds in fresh-water swamp areas. In Onondaga County, EEE has been found predominantly in the Cicero Swamp area, although positive findings have occasionally occurred outside of that area. Mosquitoes with EEE have been found consistently, although not every year, in Onondaga County with six documented human cases resulting in four deaths (the most recent death was in 2015) in the county (Syracuse.com 2018, Onondaga County Health Department 2019).

Asian Tiger Mosquito

The Asian Tiger Mosquito (*Aedes albopictus*) entered the United States in shipments of used tires from northern Asia in the mid-1980s. It can survive a wide range of climates and has spread rapidly from the point of first detection in the south-central United States. It is now widespread throughout the southern and eastern United



States. The mosquito has been found in downstate New York but has not been found in Central New York at this time. This species of mosquito transmits a variety of mosquito-borne viruses including dengue, chikungunya, yellow fever, and Zika (CDC 2017).

Location and Extent

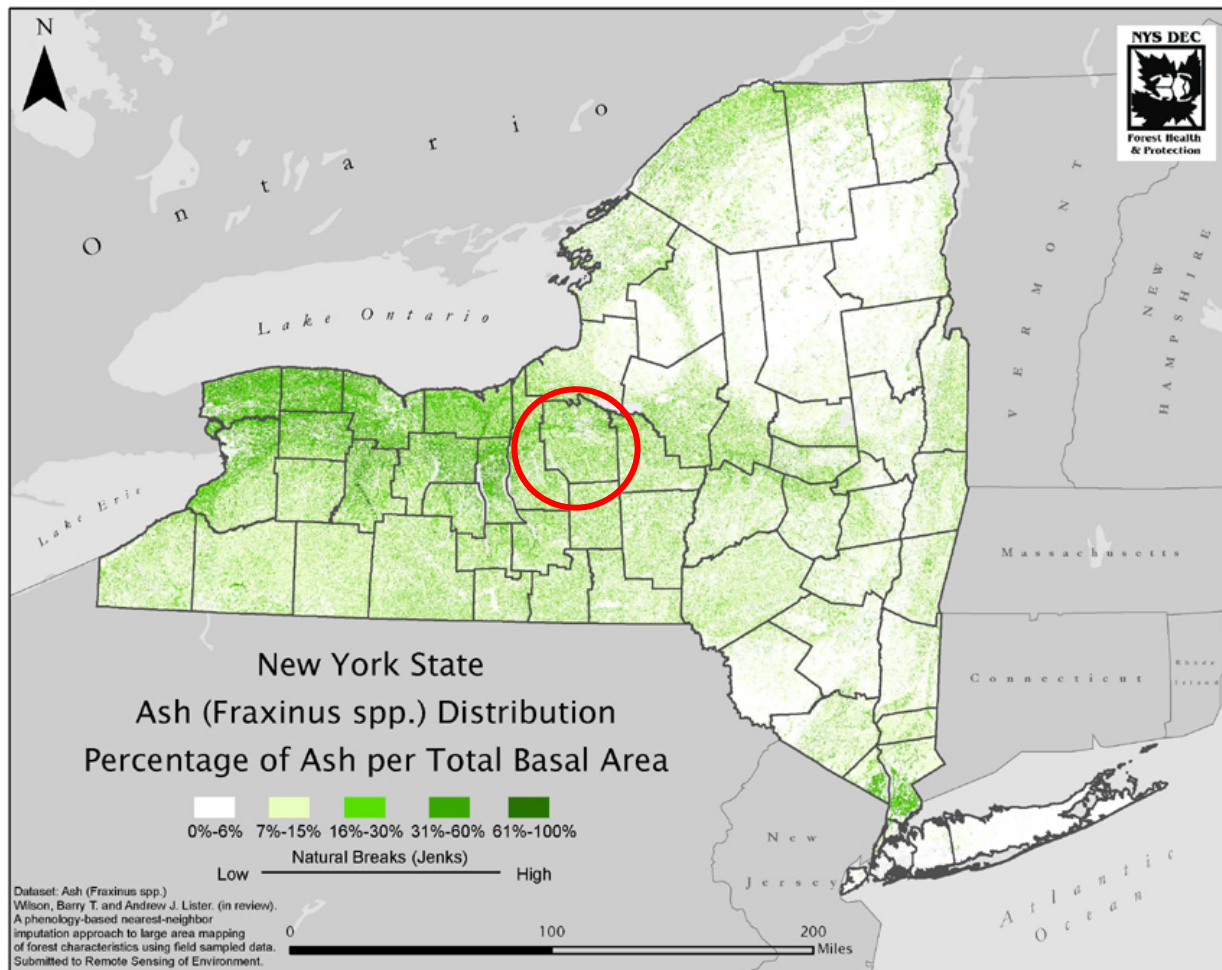
The location and extent of invasive species depends on the preferred habitat of each species, as well as the species' ease of movement and establishment. Levels of threat from invasive species range from nuisance to widespread. The threat typically intensifies when the ecosystem or host species is already stressed, such as during periods of drought. Some invasive species and infestations are found countywide. Others are limited to specific locations. Examples of known locations of invasive species and infestations within Onondaga County are described below.

Emerald Ash Borer

EAB feeds on all species of ash trees. Figure 5.4.6-1 shows the distribution of ash trees per total basal area (area occupied by tree stems) in New York State and shows Onondaga County as having between 0 percent and 60 percent distribution of ash trees per basal area. The Onondaga County EAB Task Force is tasked with the identification and treatment of EAB and the protection of the county's ash trees. The Task Force released the Onondaga County Ash Tree Management Strategy in June 2014. The Strategy estimates that one in every nine trees in the county is an ash tree. The Strategy also estimated 46,730 ash trees on county-owned land with targets in the drop zone (areas where tree limbs and tree trunks are likely to fall) although this number is not indicative of the number of such trees throughout the whole of Onondaga County.



Figure 5.4.6-1. Ash Distribution in New York State



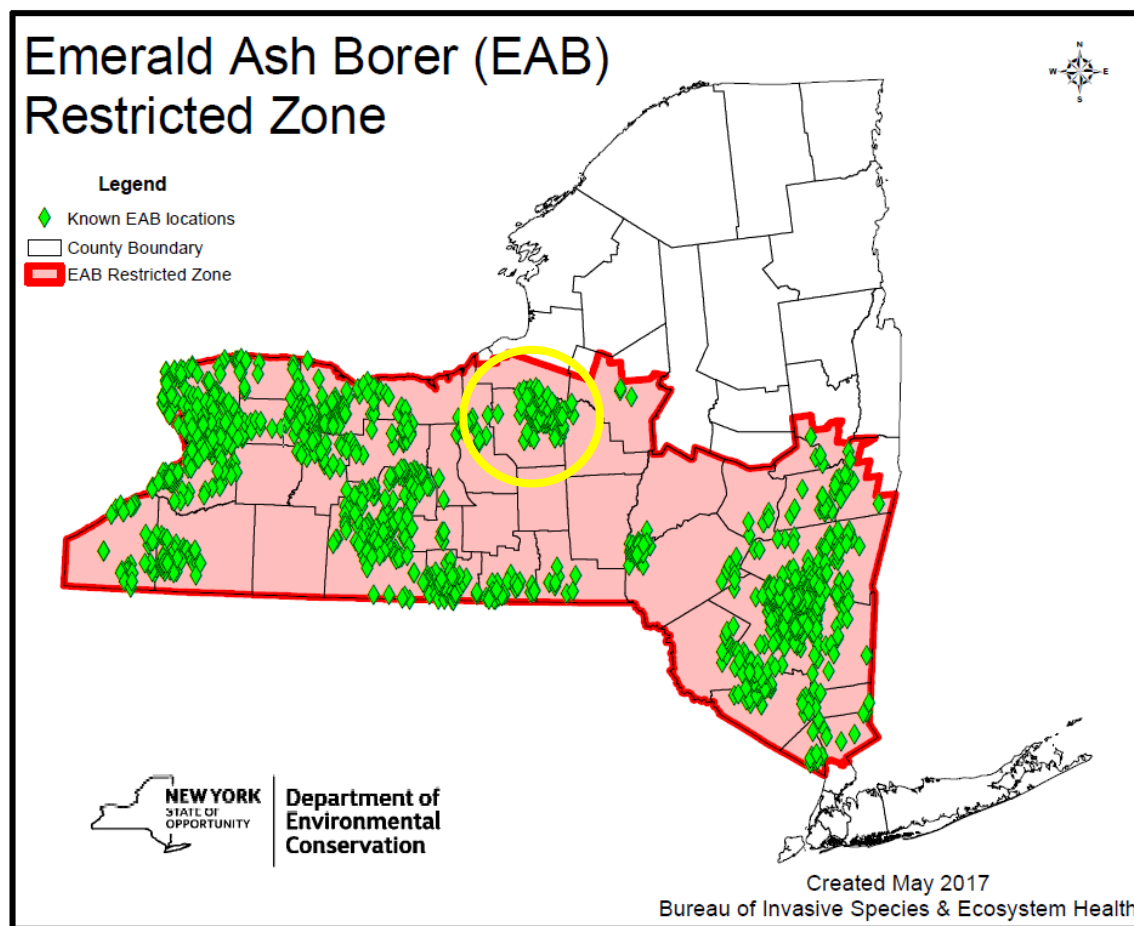
Source: NYS DEC 2017

Note: Onondaga County is circled in red.

Figure 5.4.6-2 shows the locations of EAB in 2017, as documented by NYSDEC. The figure shows Onondaga County as being in an EAB restricted (quarantine) zone which places restrictions on the movement of firewood, woodchips, and other actions that could spread EAB. Known EAB locations are located in the northeastern and central portions of the county. Figure 5.4.6-3 provides the EAB quarantine boundary for Onondaga County and the severe risk area.



Figure 5.4.6-2. Emerald Ash Borer Locations and the Restricted Zone (2017)

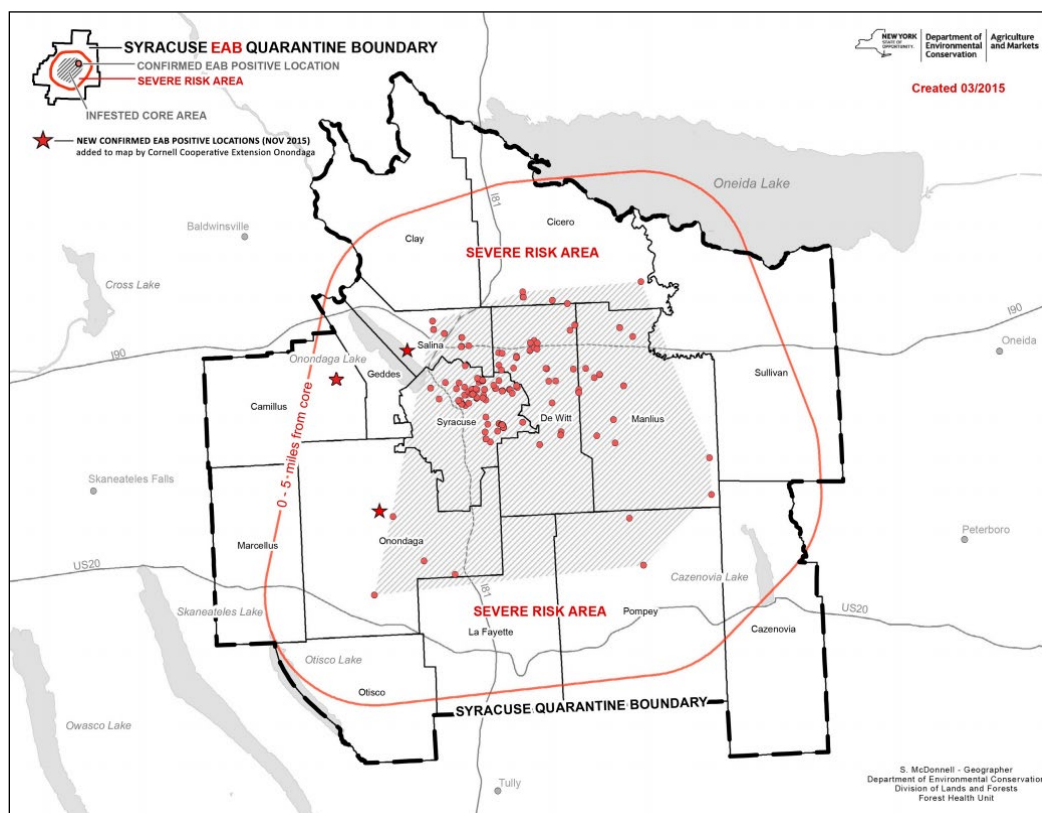


Source: NYSDEC 2017

Note: Onondaga County is circled in yellow



Figure 5.4.6-3. Syracuse EAB Quarantine Boundary (2015)



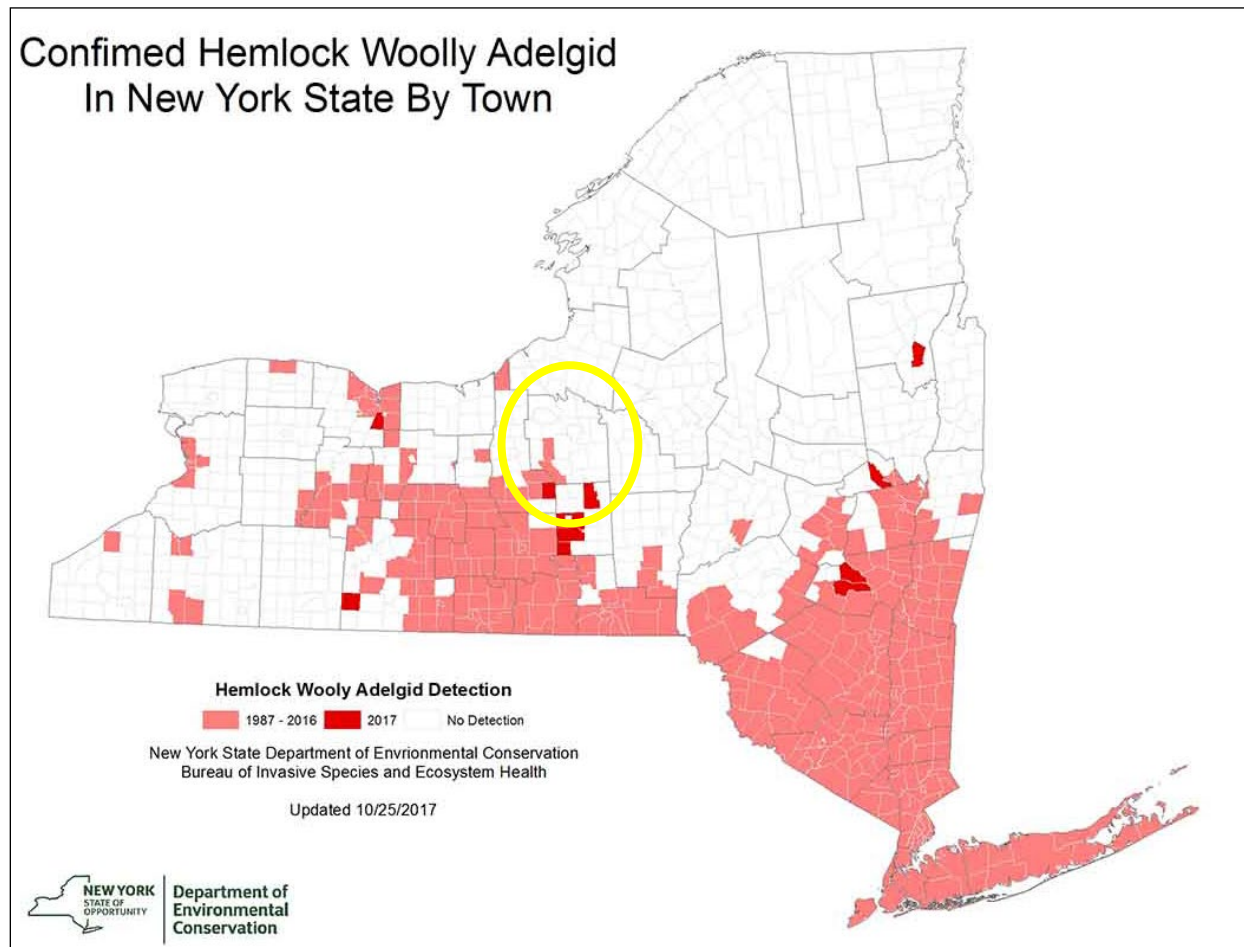
Hemlock Woolly Adelgid

Hemlock Woolly Adelgid lives and feeds on hemlock trees. It was first discovered in New York State in 1985 in the lower Hudson Valley and on Long Island. Since the initial infestation, it has continued to spread north to the Capital Region and west, through the Catskill Mountains and the Finger Lakes Region, into western New York. Figure 5.4.6-4 shows confirmed locations of hemlock woolly adelgid in New York State, with southwestern portions of Onondaga County with confirmed infestation (Towns of Marcellus, Spafford, and Skaneateles). Currently, 25 counties in New York State are infested with the hemlock woolly adelgid, including Onondaga County (NYSDEC 2019 b).

Onondaga County is exploring possible management of Hemlock Woolly Adelgid and determining the level of threat the county faces. Potential management strategies involve the removal and treatment of trees or biological control through the use of introduced predators. Cornell Cooperative Extension has been working on a biological control species to combat HWA in the Northeastern U.S. Some of these controls have already been released in Skaneateles, NY in 2014. Hemlock Woolly Adelgid defers from EAB in that Hemlock trees already been infected are still able to be treated (Onondaga County Office of the Environment 2019).



Figure 5.4.6-4. Confirmed Hemlock Woolly Adelgid in New York State by Municipality



Source: NYSDC 2017

Note: Onondaga County is circled in yellow

True Armyworm

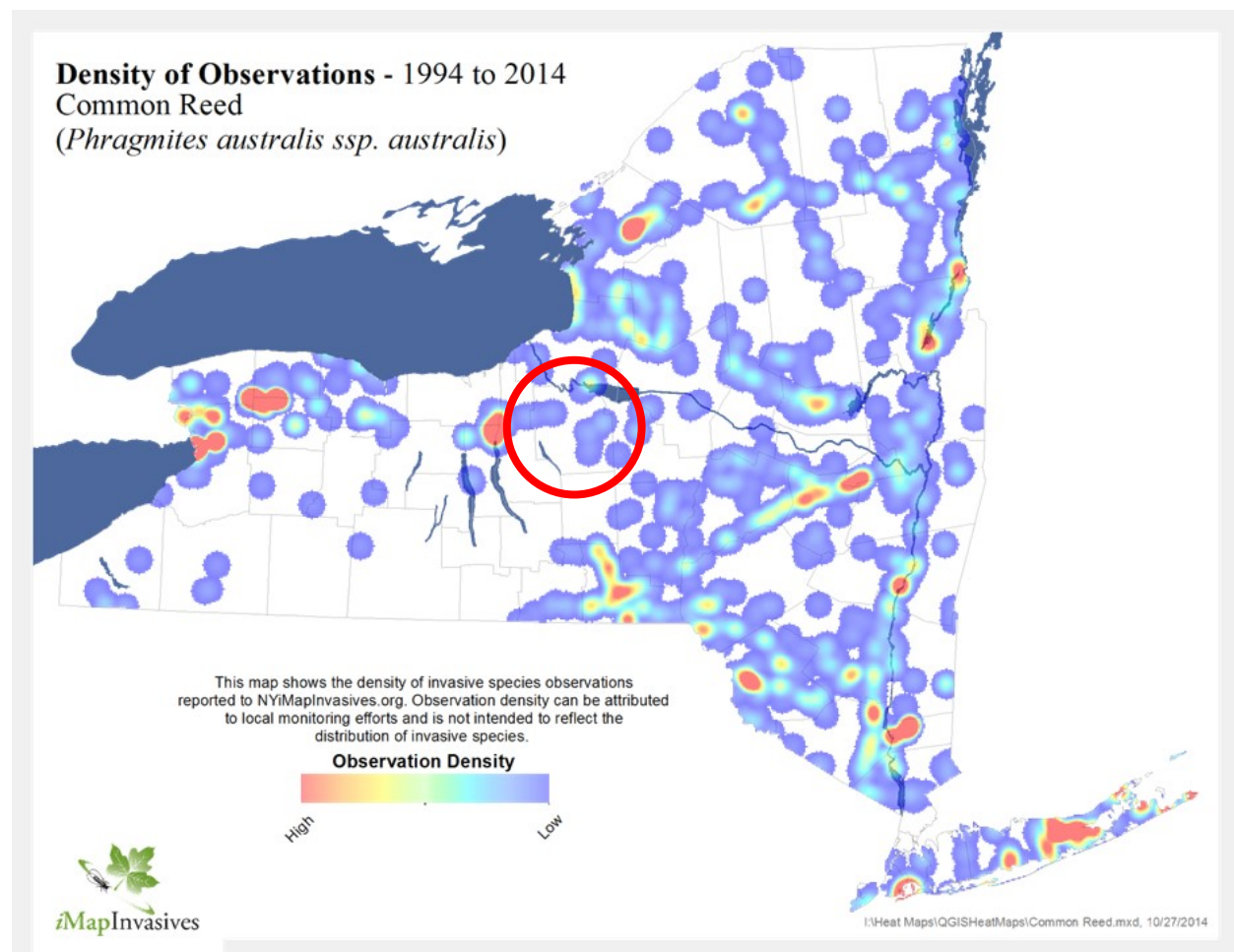
The armyworm is typically found in southern parts of the United States. Occasionally, during the growing season, the armyworm can make its way into the northern United States, including New York State (Young 2012). The most recent infestation of the armyworm in New York State occurred in 2012 when it impacted the western part of the state. Armyworms have also been reported in northern and eastern New York State and the Finger Lakes (Associated Press 2012).

Common Reed

Common reed (*Phragmites australis*) can be found throughout New York State and Onondaga County. Figure 5.4.6-5 shows the density of observations of common reed from 1994 to 2014. Any areas in or around creeks, culverts, wetlands, streams, and lakes in Onondaga County are susceptible to common reed infestations. Common reed is also common in areas of disturbed soil. Its dense growth is known to choke out natural vegetation and disrupt ecosystems.



Figure 5.4.6-5. Density of Observations of Common Reed, 1994 to 2014



Source: New York Invasive Species Information 2014

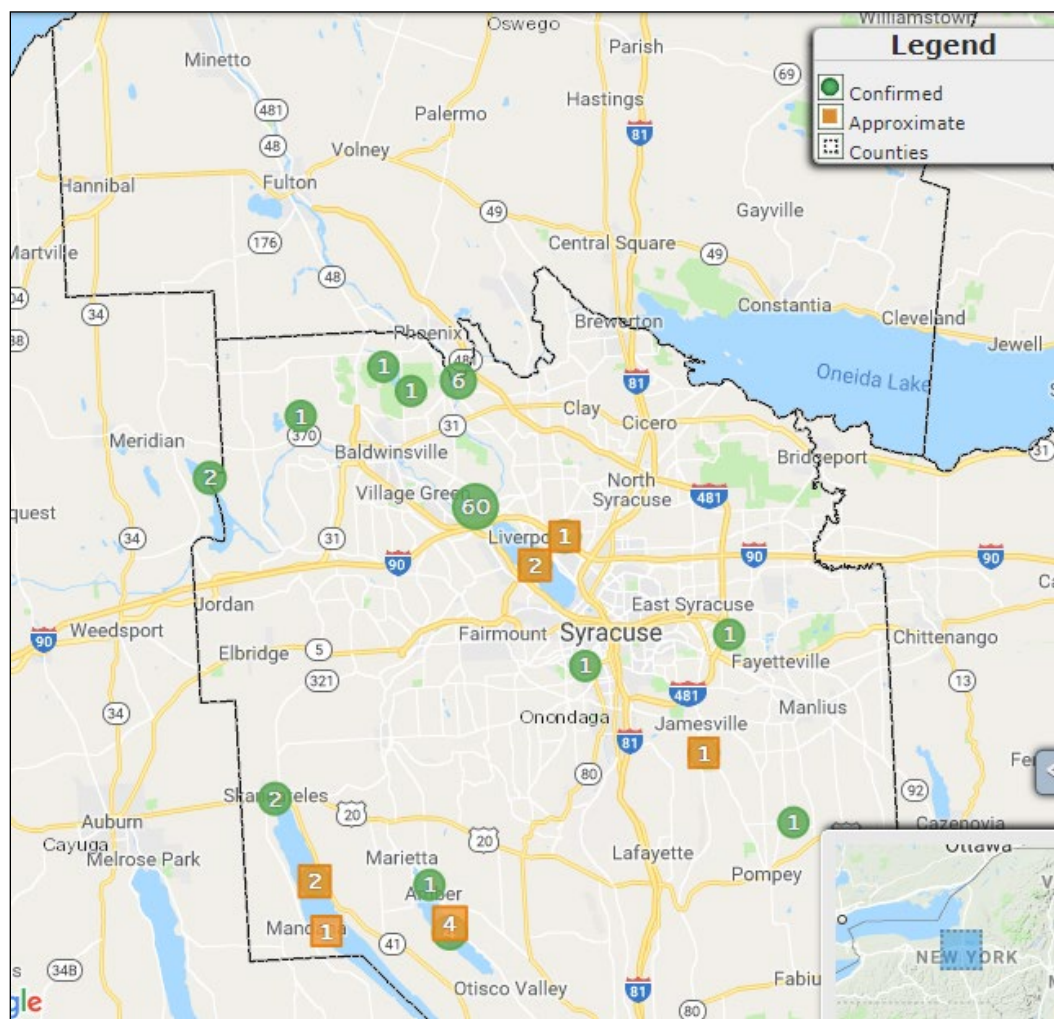
Note: Onondaga County is circled in red

Eurasian Watermilfoil

Eurasian watermilfoil is found throughout New York State and Onondaga County. Figure 5.4.6-6 shows the location of confirmed and approximate milfoil observations in Onondaga County. Milfoil has been observed on Skaneateles Lake, Otisco Lake, Onondaga Lake, Jamesville Reservoir, Seneca River, Oneida Lake, Mud Lake, Tully Lake, and the DeRuyter Reservoir. The Skaneateles Lake Association operates the Milfoil Project which has involved hand harvesting milfoil and placing benthic matting to reduce the number of patches. In 2013, it was estimated that 90 percent of the lake was milfoil free and the project has shifted to maintenance (NYSDEC 2017d). Control programs are underway in Tully Lake, Otisco Lake, and the DeRuyter Reservoir.



Figure 5.4.6-6. Confirmed and Approximate Observations of Milfoil in Onondaga County



Source: iMapInvasives 2019

Water Chestnut

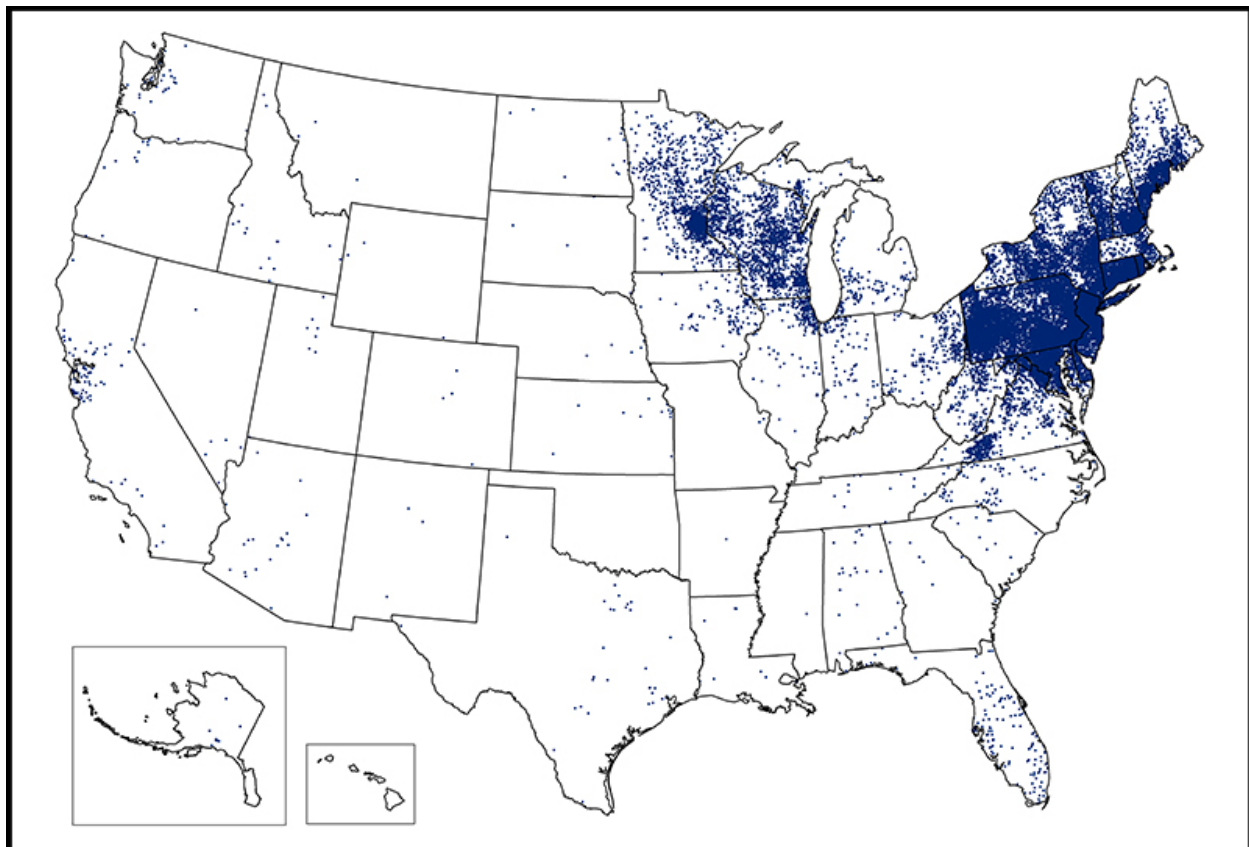
Water chestnut was first found in New York State around 1884 near Scotia (Schenectady County). NYSDEC reported that water chestnut is found in 43 counties in the state, including Onondaga County (NYSDEC 2019). Water chestnut was first found in Oneida Lake in 1999. As of 2002, Oneida Lake and the Three Rivers System were covered with more than 200 acres of water chestnut plants. Areas of heavy infestation include Ox Creek on the Oswego River and the Baldwinsville area of the Seneca River. Within the past few years, water chestnut populations have spread further in Oneida Lake (Central New York Regional Planning and Development Board 2019). Each year, the county removes water chestnuts from waterbodies in the county (The Post-Standard 2018). Water chestnut in Otisco Lake has routinely been addressed by the Otisco Lake Preservation Association. In 2018, the Onondaga County Health Department chemically treated water chestnut infestations in the Towns of Lysander, Van Buren, and Geddes and the Village of Baldwinsville (Onondaga County Health Department 2018). Great Lakes Restoration Initiative funds made available through NYSDEC has provided the bulk of water chestnut control funding. Some FLOWPA (Finger Lakes Lake Ontario Watershed Protection Alliance) funds have also been used.



Tick-Borne Diseases

Each year, approximately 30,000 cases of Lyme disease are reported to Centers for Disease Control (CDC) by state health departments. In 2017, there were 3,502 confirmed cases of Lyme disease in New York State. Between 2000 and 2016, there were 463 reported and confirmed cases of Lyme disease. The Syracuse-Onondaga County Urban Deer Task Force has been researching ways to reduce human-deer contact and the spread of Lyme disease. Since deer are the largest vector contributing to the spread of Lyme disease, management efforts by the Task Force as well as several municipalities in the county have been targeting deer populations for management practices (Onondaga County Office of the Environment 2019). Cornell Cooperative Extension has proposed an Integrated Pest Management strategy to bring together biological, cultural, mechanical and chemical options to manage ticks. Management methods include inspection (tick surveillance), identification, analysis and planning, population reduction (physical, cultural, biological, and chemical controls), monitoring (survey and sample), and record keeping (Onondaga County Office of the Environment 2019).

Figure 5.4.6-7. Reported Cases of Lyme Disease, 2017



Source: CDC 2018

Note: One dot placed randomly within county of residence for each confirmed case

Mosquito-Borne Diseases

West Nile Virus (WNV)

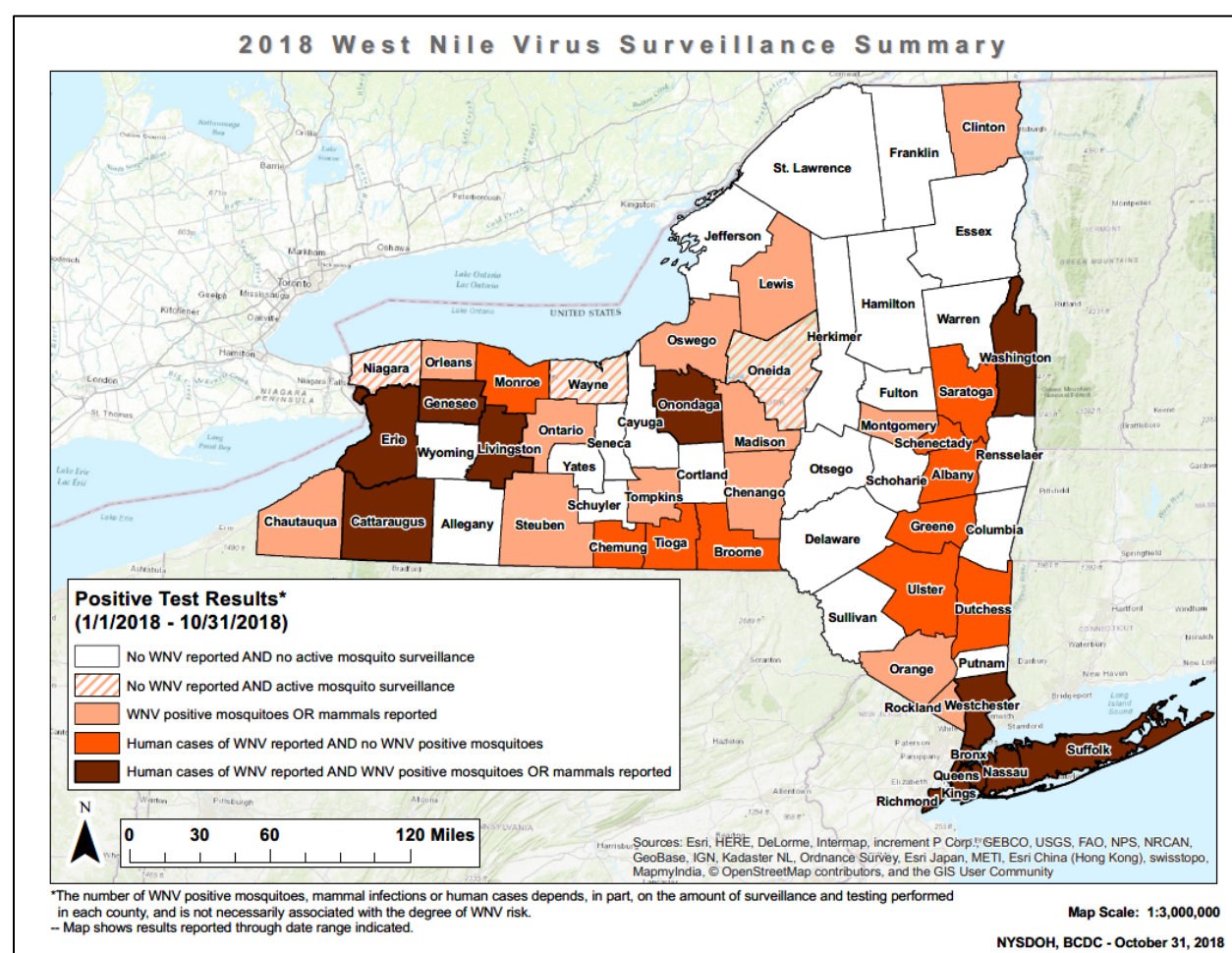
WNV was first found in New York State in 1999. Since then, 490 human cases and 37 deaths associated with WNV have been reported statewide. All of Onondaga County is exposed to WNV. Anyone exposed to infected mosquitoes is at risk of contracting with WNV. In 2000, Onondaga County was included in a federal emergency declaration related to an outbreak of the West Nile virus. In 2018, there were 90 reported human cases of WNV



in New York; two of which were reported in Onondaga County. The Onondaga County Health Department conducts aerial spraying for mosquitos in the Cicero Swamp, dependent on weather conditions and mosquito population survey (OC Health Department 2018).

There are 22 trap sites located throughout Onondaga County. Traps around Cicero Swamp are collected twice a week and the remaining traps are collected once a week from late May through September. Included in the traps are two BG-2 Sentinel Traps which specifically target the mosquito species potentially associated with the Zika Virus, *Aedes albopictus*. This mosquito species has never been found in Onondaga County. Mosquitoes in the traps are counted, sorted by species, and pools of mosquitoes (groups of 50 of the same species) are sent to the NYSDOH Wadsworth Laboratory for virus analysis, including EEE and WNV. Information about the numbers of mosquitoes trapped each week, the number of pools sent for testing each week, and any positive virus findings is posted on the Health Department website. Figure 5.4.6-8 shows the distribution of positive test results for WNV from January 1, 2018 to October 31, 2018. The figure shows that WNV in humans and mosquitoes and/or mammals was reported in Onondaga County.

Figure 5.4.6-8. 2018 WNV Surveillance in New York State



Source: NYSDOH 2018

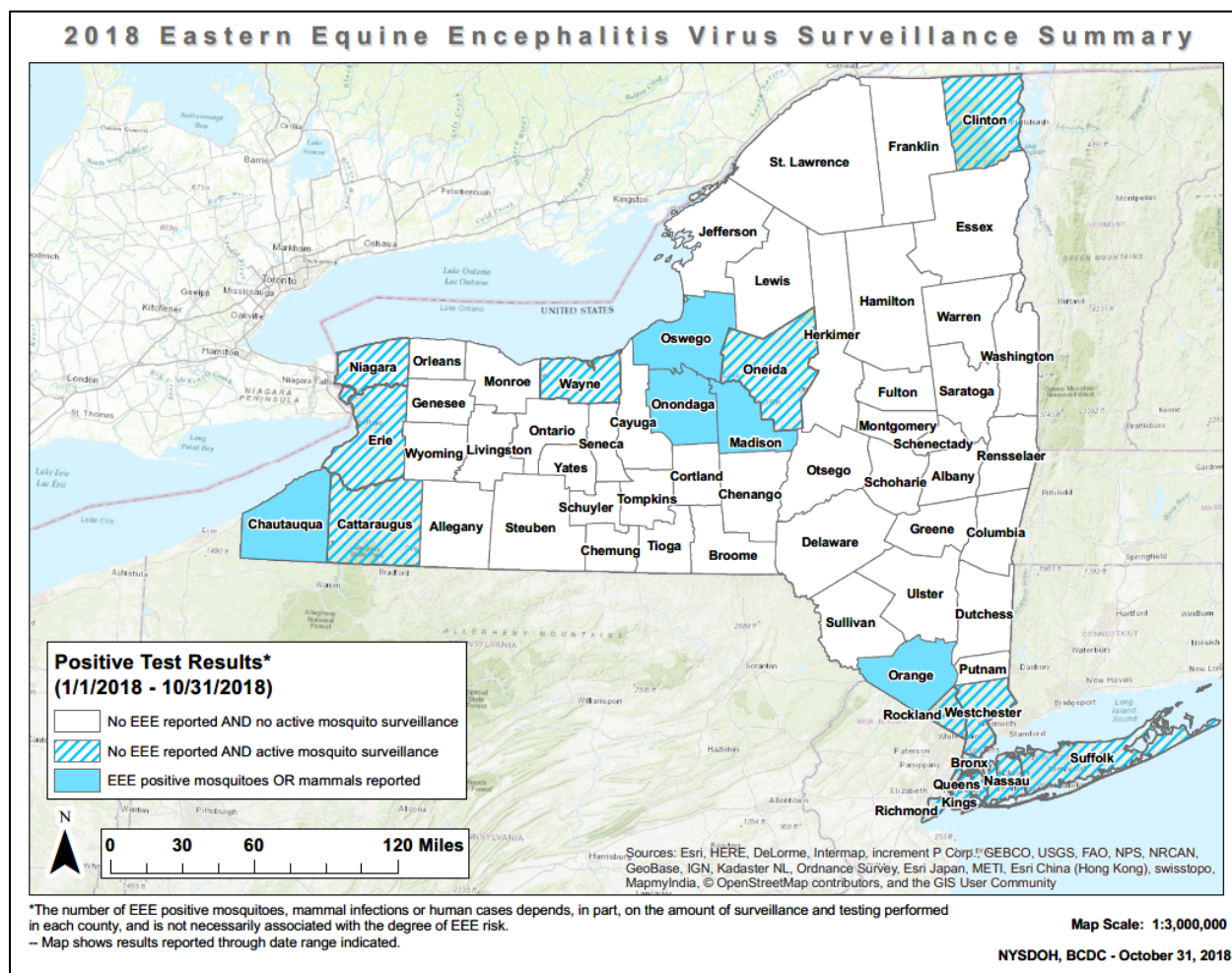
Eastern Equine Encephalitis (EEE)

Similar to WNV, anywhere mosquitos are found in Onondaga County can expose the population to contracting EEE. Between five and 10 EEE human cases are reported each year in the United States. Five cases of EEE in



humans in New York State have been reported since 1971. These cases were reported in 1971, 1983, 2009, 2010 and 2011 and occurred in Oswego and Onondaga Counties. The risk of getting EEE is highest from late July through September. In 2015, there were three reported cases of EEE, two occurring in Onondaga County. There have been no reported cases of EEE since 2015 for Onondaga County. The Onondaga County Health Department conducts aerial spraying for mosquitos in the Cicero Swamp, dependent on weather conditions and mosquito population survey (OC Health Department 2018). Figure 5.4.6-9 shows the distribution of positive test results for EEE from January 1, 2018 to October 31, 2018. The figure shows that EEE tested positive in mosquitoes and/or mammals in Onondaga County.

Figure 5.4.6-9. 2018 EEE Surveillance in New York State



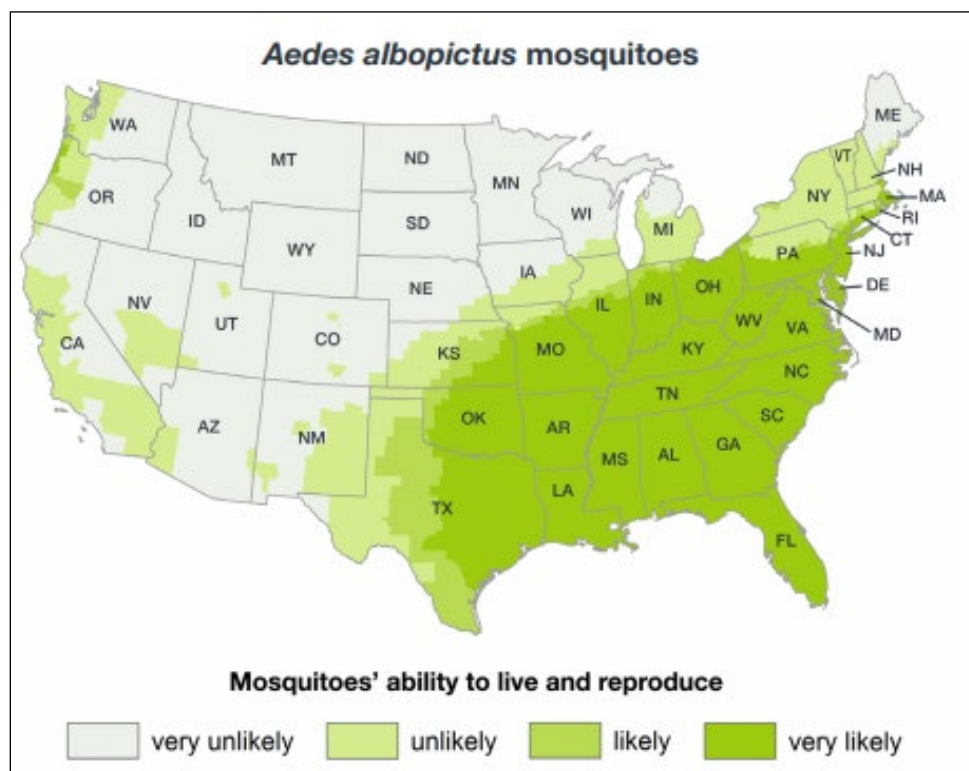
Source: NYSDOH 2018

Asian Tiger Mosquito

Figure 5.4.6-10 shows the estimated range of the Asian Tiger mosquito. While the figure below shows Onondaga County as unlikely for the Asian Tiger Mosquito to live and reproduce, there have been reports of this species of mosquito in western and southeastern New York State.



Figure 5.4.6-10. Estimated Range of the Asian Tiger Mosquito, 2017



Source: CDC 2018

Mosquito Surveillance

There are 22 trap sites located throughout Onondaga County. Traps around Cicero Swamp are collected twice a week and the remaining traps are collected once a week from late May through September. Included in the traps are two BG-2 Sentinel Traps which specifically target the mosquito species potentially associated with the Zika Virus, *Aedes albopictus*. This mosquito species has never been found in Onondaga County. Mosquitoes in the traps are counted, sorted by species, and pools of mosquitoes (groups of 50 of the same species) are sent to the NYSDOH Wadsworth Laboratory for virus analysis, including EEE and WNV. Information about the numbers of mosquitoes trapped each week, the number of pools sent for testing each week, and any positive virus findings is posted on the Health Department website (OC Health Department 2018).

Mosquito Control

Over 1,000 potential mosquito breeding sites are monitored and treated with a larvicide (Spheratax or BVA oil) if necessary. Catch basins, primarily in the City of Syracuse, are treated with Altosid XR briquettes. Unmaintained swimming pools on vacant properties are treated with B.T.I. mosquito dunks. The Health Department has the capacity to perform truck spraying in neighborhoods around Cicero Swamp and has a contract with Duflo Spray Chemical to perform aerial spraying of adulticides. Mosquito spraying only kills the adult mosquitoes in flight at the time and does not affect the eggs or larvae. Decisions to spray are made based on the numbers and species of mosquitoes present in the traps, the finding of virus, the location of virus and the time point in the season. All decisions to spray are made in cooperation with the NYSDOH and NYSDEC. From 2000 through 2018, Cicero Swamp has been aerially sprayed during ten of those years (OC Health Department 2018).



Mosquito Education

Education regarding mosquito program activities and personal protection measures are provided through the Onondaga County website, the media, public meetings, and individual contacts with local residents (OC Health Department 2018).

Previous Occurrences and Losses

FEMA has declared that New York State underwent one infestation-related emergency (EM) classified as a virus threat between 1954 and 2015. In 2000, Onondaga County was included in EM-3155 related to an outbreak of the West Nile virus (FEMA 2018). Onondaga County was also included in one USDA disaster declaration (S3411) for the armyworm outbreak in 2012.

For this HMP Update, known infestation and invasive species events impacting Onondaga County between 1980 and 2018 are listed in Table 5.4.6-1. Detailed information regarding invasive species and losses resulting from these within the county is scarce. Therefore, Table 5.4.6-1 may not include all events that occurred within the county during the period between 1980 and 2018.

Table 5.4.6-1. Infestation and Invasive Species Events in Onondaga County, 1980 to 2018

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Event Details
Pre-1990	Eurasian watermilfoil	N/A	N/A	Eurasian watermilfoil was first identified in Onondaga County.
2000	WNV	EM-3155	Yes	Onondaga County was included in EM-3155 related to an outbreak of the West Nile virus
2003	Water Chestnut	N/A	N/A	Water Chestnut was first identified in Onondaga County.
2010	EEE	N/A	N/A	One human case of EEE reported in Onondaga County.
2011	WNV	N/A	N/A	Two reported human cases of WNV in Onondaga County.
2012	Army worm	N/A	N/A	An armyworm outbreak resulted in an USDA declaration
2012-2016	Lyme Disease	N/A	N/A	Records from the CDC show that Lyme disease cases in the northeast and Onondaga County continued to grow during these years.
2012	WNV	N/A	N/A	Nine human cases of WNV reported in Onondaga County.
2014	EEE	N/A	N/A	Two human cases of EEE reported in Onondaga County.
2014	WNV	N/A	N/A	One human case of WNV reported in Onondaga County.
2014	Emerald Ash Borer	N/A	N/A	The Emerald Ash Borer was first identified in Onondaga County.
2015	EEE	N/A	N/A	Two human cases of EEE reported in Onondaga County.
2017	WNV	N/A	N/A	Two human cases of WNV reported in Onondaga County.
2018	EEE, West Nile Virus	N/A	N/A	The Onondaga County Health Department found mosquitoes infected with West Nile virus and EEE in traps (Syracuse.com 2018). There were two human cases of WNV reported in Onondaga County.

Source: EDD MapS 2018; USDA 2018; NYSDOH 2015; CDC 2017; CDC ArborNET 2018; Onondaga County Water Quality Management Program 2019; Onondaga County Ash Tree Management Strategy 2014

CDC Centers for Disease Control

EAB Emerald Ash Borer

EEE Eastern Equine Encephalitis Virus

FEMA Federal Emergency Management Agency

N/A Not applicable

WNV West Nile Virus

USDA U.S. Department of Agriculture



Regulations

The New York State Invasive Species Council is a statutory body created in 2008 by Title 17, Section 9 of the Environmental Conservation Law (ECL). Its mission is to coordinate among multiple state entities and partners to address the environmental and economic threats of invasive species. The legislation defines invasive species as “a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely causing economic or environmental harm or harm to human health.” The council is co-led by the NYSDEC and the Department of Agriculture and Markets (NYSDAM), and consists of nine members: Commissioners of the NYSDEC, NYSDAM, Transportation, and Education; the Office of Parks, Recreation, and Historic Preservation; the Secretary of State; the Chairperson of the New York State Thruway Authority; the Director of the New York State Canal Corporation; and the Chairperson of the Adirondack Park Agency (NYSDEC, 2015).

The NYSDEC, in cooperation with the Department of Agriculture and Markets, adopted new invasive species regulations (6 *New York Codes Rules and Regulations* [NYCRR] Part 575) in March of 2015. The regulations include a list of prohibited species possession, of which shall be unlawful with intent to sell, import, purchase, transport, or introduce; a list of regulated species that shall be legal to possess, sell, purchase, propagate, and transport, but may not be knowingly introduced into a free-living state; and requirement of a permit for education, research, and other approved activities involving prohibited species and release of regulated species into a free-living state. The regulation also specifies the criteria for imposing these classifications and a means for future classification of species. The proposed regulation establishes grace periods for certain prohibited species to allow businesses to plan management of existing stock (NYSDEC 2015).

The New York State Invasive Species Program is made up of several components:

- **Environmental Protection Fund:** The invasive species line item is the lifeline supporting the infrastructure of the statewide invasive species program, first described in the 2005 NYS Invasive Species Task Force Report, and outlined below. Many of the components are administered as contracts through the NYS Department of Environmental Conservation (Finger Lakes PRISM 2019).
- **New York Invasive Species Council:** Nine state agencies, co-chaired by NYS Department of Environmental Conservation and NYS Department of Agriculture and Markets.
- **New York State Invasive Species Advisory Committee:** Twenty-five representative stakeholders including environmental, academic, and industry groups (Finger Lakes PRISM 2019).
- **Invasive Species Coordination Unit:** Two coordinating staff at the NYS Department of Environmental Conservation housed within the Division of Lands and Forests (Finger Lakes PRISM 2019).
- **Partnerships for Regional Invasive Species Management (PRISMs):** Eight regional public-private partnerships established across New York to coordinate invasive species prevention and management and deliver on-the-ground programming. Onondaga County is part of the Finger Lakes PRISM (Finger Lakes PRISM 2019).
- **iMapInvasives:** Web-based database and mapping system that stores and displays statewide invasive species occurrence, treatment, and assessment information for agencies and citizens alike (Finger Lakes PRISM 2019).
- **New York Invasive Species Clearinghouse:** Web-based gateway to access timely, accurate, scientific, and policy information and information on upcoming invasive species events and invasive species news of interest (Finger Lakes PRISM 2019).
- **New York Invasive Species Education Program:** Education program integrated within the Cornell Cooperative Extension Network that provides high quality science-based educational programs and cutting edge research-based information regarding invasive species of major concern (Finger Lakes PRISM 2019).



- **New York Invasive Species Research Institute:** Virtual institute that serves the scientific research community, natural resource and land managers, and state offices by promoting information-sharing and developing recommendations and implementation protocols for research, funding, and management to improve the scientific basis of invasive species management (Finger Lakes PRISM 2019).
- **Additional Components:** The State of New York’s invasive species program also leads special projects as needed, and as resources and capacity allow, such as offering an Invasive Species Eradication Grant Program; preparing a NYS Invasive Species Management Strategy; coordinating and streamlining regulatory processes; implementing regulatory and encouraging non-regulatory approaches to prevention; supporting invasive species research, and responding to new species introductions to the state, among other initiatives (Finger Lakes PRISM 2019).

Climate Change Projections

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Onondaga County is part of Region 6, the Tug Hill Plateau. In Region 6, it is estimated that temperatures will increase by 4.4°F to 6.4°F by the 2050s and 5.9°F to 10.0°F by the 2080s (baseline of 45.4°F, mid-range projection). Precipitation totals will increase between 4 and 10% by the 2050s and 6 to 12% by the 2080s (baseline of 42.6 inches, mid-range projection) (NYSERDA 2014).

Climate change and the globalization of trade, travel, and transport are greatly increasing the number and type of species moved around the world, as well as the rate of movement. Changes in land use and climate are also rendering some habitats more susceptible to the establishment of nonnative species and may amplify the adverse impacts of biological invasion (NISC 2016).

Warmer temperatures and changing rainfall patterns provide an environment where mosquitos can remain active longer, greatly increasing the risk for animals and humans. Lyme disease could also expand throughout the United States as temperatures warm, allowing ticks and species that carry ticks to move into new areas of the country. The changes in climate can also allow tropical and subtropical insects to move from regions where diseases thrive into new places (Natural Resources Defense Council 2015). Armyworms die in colder temperatures. Warmer spring and winter temperatures allow them to continue to reproduce—a factor contributing to the outbreak in 2012. Mosquitoes capable of carrying and transmitting diseases now live in at least 28 states. Warmer temperatures, heavy rainfall, and high humidity have reportedly increased the rate of WNV infections in humans (Natural Resources Defense Council 2015). As temperatures increase and rainfall patterns change, these insects can remain active for longer seasons and within wider areas.

As climate change continues to take place, it is anticipated that the occurrence of invasive species is likely to increase in Onondaga County, particularly by southern species that expand their range to the north as temperatures warm.

Probability of Future Occurrences

Based on historical documentation and given the overall impact of changing climate, New York State is expected to undergo increased incidences of invasive species. Onondaga County and all its jurisdictions will continue under threat of invasive species that may induce secondary hazards and health threats to the county population if invasive species are not prevented, controlled, or eradicated.

Based on historical records and input from the Planning Partnership, probability of occurrence of invasive species in Onondaga County is considered *frequent* (100% annual probability; a hazard event may occur multiple times per year).



5.4.6.2 VULNERABILITY ASSESSMENT

All of Onondaga County has been identified as the hazard area for invasive species and infestations; therefore, all assets within the county, as described in the County Profile (Section 4), are vulnerable to the invasive species and infestation hazard. Invasive species and infestations are of significant concern to Onondaga County, mainly due to their effects on public health, natural resources, and agriculture. Estimated losses are difficult to quantify; however invasive species and infestations can impact Onondaga County's population and economy. Direct effects of infestation lead to cascading indirect impacts. As species compositions change due to infestation outbreaks, whole fire regimes can shift. Physical stresses on trees may also affect how trees respond to other natural hazards such as hurricanes, drought, and ice storms (Kurtz 2007). The following text details the analysis of potential impacts of the invasive species hazard on Onondaga County.

Impact on Life, Health and Safety

The entire population of Onondaga County (population of 468,050 people [US Census Bureau 2016]) is vulnerable to insect borne diseases that can be carried by invasive insects such as species of ticks and mosquitos. According to the U.S. Census 2016 ACS 5-Year Population Estimate, 71,770 people, or 15.3-percent of the population in Onondaga County, is aged 65 and over, and 26,848 people, or 5.7 percent of the population is aged under 5 years. The elderly population and people with suppressed immune systems are most susceptible to effects of West Nile Virus, while these populations and children under 15 are most at risk for complications from EEE (Onondaga County Health Department, Date Unknown). Lyme disease, spread by ticks, is prevalent throughout the County and can severely impact all populations. In Onondaga County, the following areas have the highest concentration of elderly population: City of Syracuse and Villages of Baldwinsville, East Syracuse, Fayetteville, Liverpool, Minoa, and North Syracuse; locations of higher concentrations are also present in areas throughout each of the county's towns. Population densities for populations under the age of 16 follow a similar distribution. Refer to Figure 4-9 and Figure 4-10 in Section 4 (County Profile) which displays the densities of populations over 65 and populations under 16 in Onondaga County.

Species that cause eventual destabilization of soil, such as invasive insects that destroy plants or invasive plants that outcompete native vegetation but have less effective root systems, can increase runoff into waterbodies. This can lead to increased harmful algal blooms and negative impact on drinking water supplies. Soil destabilization can also increase the likelihood of mudslides in areas with steep slope.

Species that kill trees such as EAB and Hemlock Woolly Adelgid, can increase the likelihood of trees or branches falling on people or knocking out utilities that people are dependent on. An inventory of ash trees on county owned land found that 46,730 trees are located in areas where falling branches or the tree itself could cause safety concerns (OCATMS 2014).

Impact on General Building Stock and Critical Facilities

No structures are anticipated to be affected directly by invasive species and infestations; however, as vegetation dies or becomes stressed and weakened by pests such as the Emerald Ash Borer, buildings, utilities, roads, and other infrastructure are vulnerable to damage by falling trees and debris. Additionally, available fuel and high-intensity wildfires increase with the increase in deceased vegetation. Physical stresses on trees may also affect how trees respond to other natural hazards such as windstorms, drought, and ice storms (Kurtz 2007).

The Emerald Ash Borer and Hemlock Woolly Adelgid may cause a catastrophic loss of ash and hemlock trees throughout public parks and forests, which could result in stream bank instability, erosion, and increased sedimentation. Specifically, the hemlock tree is one of few species well suited for growth on steep slopes and helps to stabilize the soil (NYSDEC, n.d.). Unstable slopes in areas of infected hemlock tree may lead to a higher risk to impacts from ground failure for buildings, utilities and infrastructure downslope. In addition, a



preponderance of dead tree limbs could increase the occurrence of downed trees on roadways and power lines in storms with heavy winds.

Some invasive plants have been shown to destabilize soil due to high densities and shallow root systems, negatively impacting nearby buildings and septic systems. This could also lead to degraded water quality in water bodies next to areas with steep slope and destabilized soils. Other invasive plant species such as phragmites and purple loosestrife have been known to clog culverts and streams, increasing flooding risk and compromising roads and pipes. In severe occurrences, utilities may also be interrupted by invasive plants, such as hydrilla, blocking the water intakes of treatment plants and power generation facilities (New York Invasive Species Information 2012).

Impact on the Economy

Impacts of invasive species and infestations on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with activities and programs implemented to conduct surveillance and address invasive species and infestations have not been quantified in most available documentation. Other financial resources to address invasive species are dedicated annually from NYS DEC, Onondaga County Health Department, CCE, universities, and Lake Associations. Spreads of diseases will impact worker productivity as individuals miss work to recover or care for family members. Both Purple Loosestrife and phragmites can block agricultural drainage and irrigation ditches, thus altering water flow and impacting crop yields (Ontario Phragmites Working Group, n.d.; New Hampshire Department of Environmental Services 2018). Crop losses from invasive species and infestations may be significant; during 2012, the county's crop was severely impacted by the Armyworm. According to the 2012 Agricultural Census for Onondaga County, the County has 681 farms, spread over 150,000 acres, which are vulnerable to the impacts of invasive species and infestations. The County's market value of agricultural products is over \$150 million (Census of Agriculture 2012).

The Emerald Ash Borer can infect nursery stock and mature trees, which could reduce the timber value of hardwood exports (CFIA 2014). In 2010, the USDA Northern Research Station conducted computer simulations of EAB spread to estimate the cost of ash tree treatment, removal, and replacement (re-planting of new trees) 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 (USDA 2013). The Onondaga County Ash Tree Strategy estimated a cost of \$13.5 million (\$15.3 million if paid through bonds) for ash tree management to combat EAB through tree removal and replacement, tree inoculation, administrative costs, etc.

Invasive species can have major impacts on the recreational value of natural lands. Phragmites reduce the recreational value of an area by creating dense and tall communities that can outcompete native vegetation and obscure views for birdwatchers, walkers, hunters, etc., as well as having the ability to cut the skin of these visitors (USFWS 2007). Purple loosestrife can also outcompete and displace native vegetation, which reduces the native habitat size and negatively impacts fish spawning and waterfowl habitat. Like phragmites, these impacts reduce the recreational values for birdwatchers, walkers, hunters, and other visitors to the area (New Hampshire Department of Environmental Services 2018). Both Eurasian watermilfoil and hydrilla form thick mats that block sunlight from reaching native plants below the surface and displacing native vegetation. The spread of both species can lead to a reduction in fish spawns and growth rates and prevent native waterfowl from feeding in infested waterbodies. The thick mats on the water surface can impede boaters from traveling through the waterbodies, deter swimmers from using these waterbodies, and lower the appeal of the county's waterfront housing as well. In areas with major colonies of either species, values of shoreline properties have been seen to decline, impacting the homeowners and communities relying on taxation of these properties (New York Invasive Species Information, n.d.; New York Invasive Species Information 2012). According to New York Invasive



Species Information, the State spends in excess of half a million dollars per year controlling Eurasian watermilfoil.

Future Changes that May Impact Vulnerability

Understanding future changes that 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 to examine potential conditions 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

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Onondaga County. Any areas of growth could be impacted by invasive species because the entire planning area is exposed and vulnerable. As discussed earlier, changes in land use have the potential to 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 invasive species naturally. The specific areas of development are indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

According to population projections from the Cornell Program on Applied Demographics, Onondaga County will experience a slight population decrease through 2040 (less than 10,000 people in total by 2040). Population change is not expected to have a measurable effect on the overall vulnerability of the county's population over time. As discussed in *Long Range Transportation Plan 2050: Moving Towards a Greater Syracuse*, the population of Syracuse has decreased as the other municipalities in the county have seen an increase (Syracuse Metropolitan Transportation Council, 2015). Those moving from areas of lower vulnerability to higher will increase their vulnerability, though not in a dramatic fashion. Refer to Section 4.4.2 - Population Trends in the County Profile (Section 4) for a discussion on population trends in the county.

Climate Change

Onondaga County will see increases in the average annual temperature and changes in precipitation patterns. As the climate warms, the habitat range will increase for insects including mosquitoes, ticks, and armyworms. As discussed earlier, increases in the rate of West Nile Virus infections has been correlated to increasing temperatures and precipitation amount. The increased average temperatures will allow the insects to survive for longer periods of time throughout the year and extend the time that populations are susceptible to infection by an insect borne disease. In addition to allowing for longer periods of time for insects to survive, the warmer temperatures will create a climate that will allow for the invasive plant species to thrive for longer periods of time, potentially increasing the extent of their impact. Climate change may result in increased stresses on crops, possibly resulting in increased susceptibility to invasive species damages.

Change of Vulnerability Since the 2013 HMP

The invasive species and infestation profile is new to the Onondaga County Hazard Mitigation Plan for 2019.



Issues Identified

The potential impacts insect-borne diseases to the elderly population can be substantial. The elderly population and young children are the most susceptible to the effects of WNV and EEE and make up over 17 percent of the county's total population. Lyme disease is widespread in the county and can have severe health impacts. Invasive species can cause devastating impacts to the agricultural industry in Onondaga County, leading to crop losses. EAB is very common in the county and is killing the ash trees throughout.

Unstable slopes in areas of infected hemlock trees may lead to a higher risk to impacts from ground failure for buildings and infrastructure downslope and have negative impacts on water quality due to soil erosion, which could have significant impacts on drinking water sources like Skaneateles Lake. Dead trees from both EAB and Woolly Hemlock Adelgid pose a threat to the utility lines and infrastructure as well as public safety from falling branches and trees.

Some invasive plants have been shown to destabilize soil due to high densities and shallow root systems, negatively impacting nearby buildings and septic systems. Other invasive plant species such as phragmites and purple loosestrife have been known to clog culverts and streams, increasing flooding risk. In severe occurrences, utilities may be interrupted by invasive plants, such as hydrilla, blocking the water intakes of treatment plants and power generation facilities.

All invasive species present a risk to natural ecosystems and may have cascading ecological impacts ranging from the ouster of natural species to reduction in available nutrients for plants and oxygen for aquatic species.