

5.4.6 Infestation and Invasive Species

This section provides a hazard profile and vulnerability assessment of the infestation and invasive species hazard for the Tompkins County Hazard Mitigation Plan (HMP).

The hazard profile is organized as follows:	The vulnerability assessment is organized as follows:
<ul style="list-style-type: none"> • Description • Extent • Previous Occurrences and Losses • Probability of Future Occurrences • Climate Change Impacts 	<ul style="list-style-type: none"> • Impact on Life and Safety • Impact on General Building Stock • Impact on Community Lifelines • Impact on Economy • Impact on Environment • Cascading Impacts on Other Hazards • Future Change that may Impact Vulnerability • Changes Since 2014 HMP • Identified Issues

5.4.6.1 Hazard Profile

This section presents information regarding the description, extent, location, previous occurrences and losses, and probability of future occurrences for the infestation and invasive species hazard.

Description

Invasive Species

According to the New York State Department of Environmental Conservation, invasive species are non-native plant and animal 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 and plant 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).

Thousands of species have been introduced in the U.S., posing serious threats to agriculture, human health, and the integrity of land and water. New York State is vulnerable to damages from these invasive species. The following list contains the names of invasive species found in New York State. This list does not include all



plant species that are invasive or potentially invasive in the State. Jurisdictions in Tompkins County and the Tompkins County Soil and Water Conservation District are devoting resources to help control the invasive plant species populations, along with adopting codes and guidelines to help regulate and control the planting of different plant species. An invasive plant can thrive and spread aggressively outside its native range. A naturally aggressive plant may be especially invasive when it is introduced to a new habitat (USDA 2017). Invasive plants include invasive aquatic plants. Invasive aquatic plants are introduced plants that have adapted to living in, on, or next to water, and can grow either submerged or partially submerged in water (USDA 2017). Invasive plants often are introduced to a new area for ornamental gardening.

Infestation

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 insect borne diseases such as West Nile Virus, Lyme disease, Eastern Equine Encephalitis, La Crosse Encephalitis, Powassan Virus, St. Louis Encephalitis, Western Equine Encephalitis. These diseases are discussed in the disease outbreak profile, Section 5.4.1.

New York State has been impacted by various past and present infestations including Asian longhorned beetles; and hemlock woolly adelgid. Other infestations that have impacted the State include: Emerald Ash Borer, and Sirex Woodwasp. Some infestations, like hemlock woolly adelgid and Emerald Ash Borer, have already occurred in Tompkins County. The following infestations listed below, will further be discussed in this section.

The following table provides the animal and pathogen species that currently affect or may soon affect the natural areas of Tompkins County.

Figure 5.4.6-1. Animals, Plants, Insects, and Pathogens Impacted Natural Areas of Finger Lakes Region

Name	Species Type	Name	Species Type
Agriculture Weeds	Plant	Japanese Barberry	Plant
Akebia	Plant	Japanese hedgeparsley	Plant
Alewife	Fish	Japanese Stiltgrass	Plant
Amur River, California, Common privet	Plant	Kudzu (Not yet in region)	Plant



Name	Species Type	Name	Species Type
Amur cork-tree	Plant	Leafy Spurge	Plant
Asian bittersweet	Plant	Lesser celandine	Plant
Asian Clam	Fish	Lily-of-the-valley	Plant
Asian Longhorned Beetle (Not yet in region)	Insect	Mile-a-Minute	Plant
Asian Maple	Plant	Moneywort, creeping jenny	Plant
Autumn Olive	Plant	Mugwort	Plant
Balsam Woolly Adelgid (Not yet in region)	Insect	Multiflora Rose	Plant
Bittersweet nightshade	Plant	Norway Maple	Plant
Black locust	Plant	Norway Spruce	Plant
Black swallowwort	Plant	Oriental Bittersweet	Plant
Brittle Naiad (water nymph)	Plant	Pale swallowwort	Plant
Brazilian Elodea/waterweed (Not yet in region)	Plant	Periwinkle	Plant
Brown/Black Knapweed	Plant	Pondweed (Curly-leaf, Giant, Japanese)	Plant
Buckthorn (and Alder)	Plant	Porcelain-berry	Plant
Burning Bush/Winged euonymus	Plant	Purple Loosestrife	Plant
Callery Pear	Plant	Quagga Mussel	Mollusk
Canada Thistle	Plant	Reed canary grass	Plant
Common Crane Fly	Insect	Rocket	Plant
Common Reed Grass/Phragmites	Plant	Round Goby	Fish
Crabapple	Plant	Sheep sorrel	Plant
Creeping bellflower	Plant	Sirex (European Woodwasp)	Insect
Creeping Thistle	Plant	Slender Falsebrome	Plant
Crownvetch	Plant	Spiny Waterflea	Zooplankton
Daylily	Plant	Spotted Knapweed	Plant
Emerald Ash Borer	Insect	Spotted Wing Drosophila	Insect
English Ivy	Plant	Starry Stonewort	Plant
Eurasian Boar	Animal	Stilt-grass	Plant
Eurasian Watermilfoil	Plant	Swallow-worts	Plant
European black alder	Plant	Swede Midge	Insect
European barberry	Plant	Sycamore maple	Plant
European Crane Fly	Insect	Tree of heaven/ailanthus	Plant
European dewberry	Plant	Variable-leaf Watermilfoil	Plant
European Frog-bit	Plant	Water Chestnut	Plant
Evergreen bittersweet	Plant	White bedstraw	Plant
Fanwort	Plant	Wild Chervil	Plant
Fishhook Waterflea	Zooplankton	Wild onion/onion-grass	Plant
Flowering Rush	Plant	Wild Parsnip	Plant
Forget-me-not	Plant	Wineberry	Plant
Garlic Mustard	Plant	Wisteria	Plant
Giant Hogweed	Plant	Yellow-flag iris	Plant



Name	Species Type	Name	Species Type
Goutweed, bishop's weed	Plant	Yellow Floating Heart	Plant
Hairy cress	Plant	Yellow Iris	Plant
Hedge Maple	Plant	Zebra Mussel	Mollusk
Hemlock Woolly Adelgid	Plant		
Honeysuckle (Japanese, Maack's, Tartarian)	Plant		
Hydrilla	Plant		

Source: Finger Lakes PRISM, 2020; Tompkins County Environmental Management Council 2018

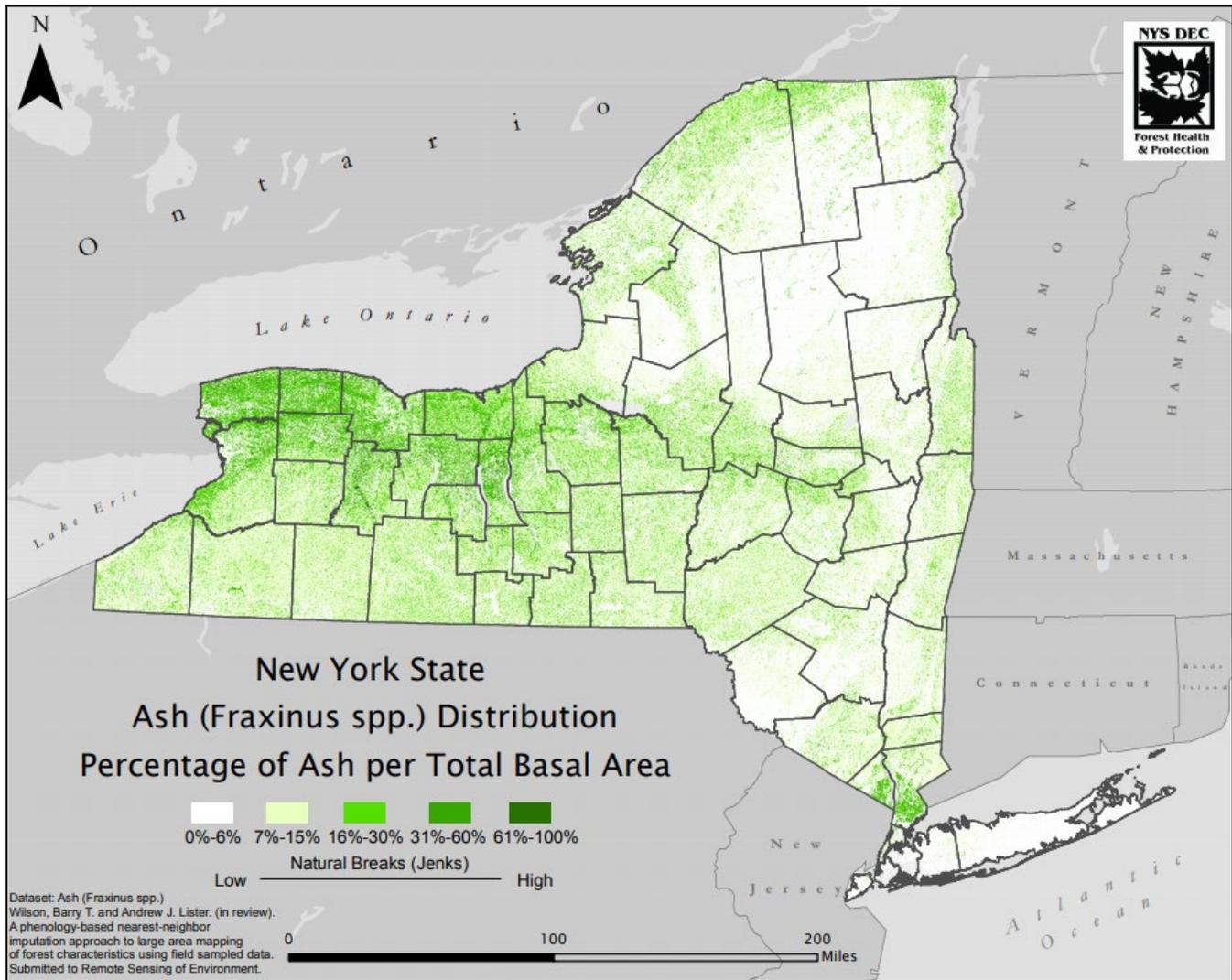
For this HMP Update, the following non-native species will be discussed in further detail for Tompkins County:

Garlic Mustard is a species that has spread across the United State over the past 150 years. The plant can often be found in the undergrowth of disturbed woodlots and forest edges but can also be found in pristine areas. The plant was originally introduced to the united states as a medicinal plan but then started spreading uncontrollably across the nation and into Canada. The plant is biennial and takes 2 years to fully mature but during growth, tends to cluster in dense packs and stifle any other existing plants (NYSDEC, 2020). Generally, Garlic Mustard is considered one of the invasive plant species that has the lowest impact and the recommended approach to managing is to leave it alone.

Emerald Ash Borer (EAB) is a wood boring beetle native to Asia that feed on and kill all native ash tree species. The beetle was first found in 2002 near Detroit, Michigan and has since spread to 13 states and 2 Canadian provinces, killing many millions of ash Trees in both urban and rural settings. In New York State, a quarantine zone was created to contain the spread of this beetle, of which Tompkins County is included. In general Ash is a common tree found throughout most of New York State and comprises nearly 8% of all trees within the state. As the tree is a common food source and is commonly used in lumber, the effect of the EAB in New York State can be significant. A map below provided by NYSDEC shows the general population of ash. Increased woodpecker activity is often the first sign of an EAB infestation and most tree die within 2 to 4 years after being infected. The population of EAB is increasing quickly across the state, however, DEC is not actively pursuing management of this invasive species currently (NYSDEC, 2020). There is a biocontrol being pursued at the federal level by USDA and releases of the biocontrol are beginning to occur in New York State.



Figure 5.4.6-2. General Population of Ash Trees in New York State

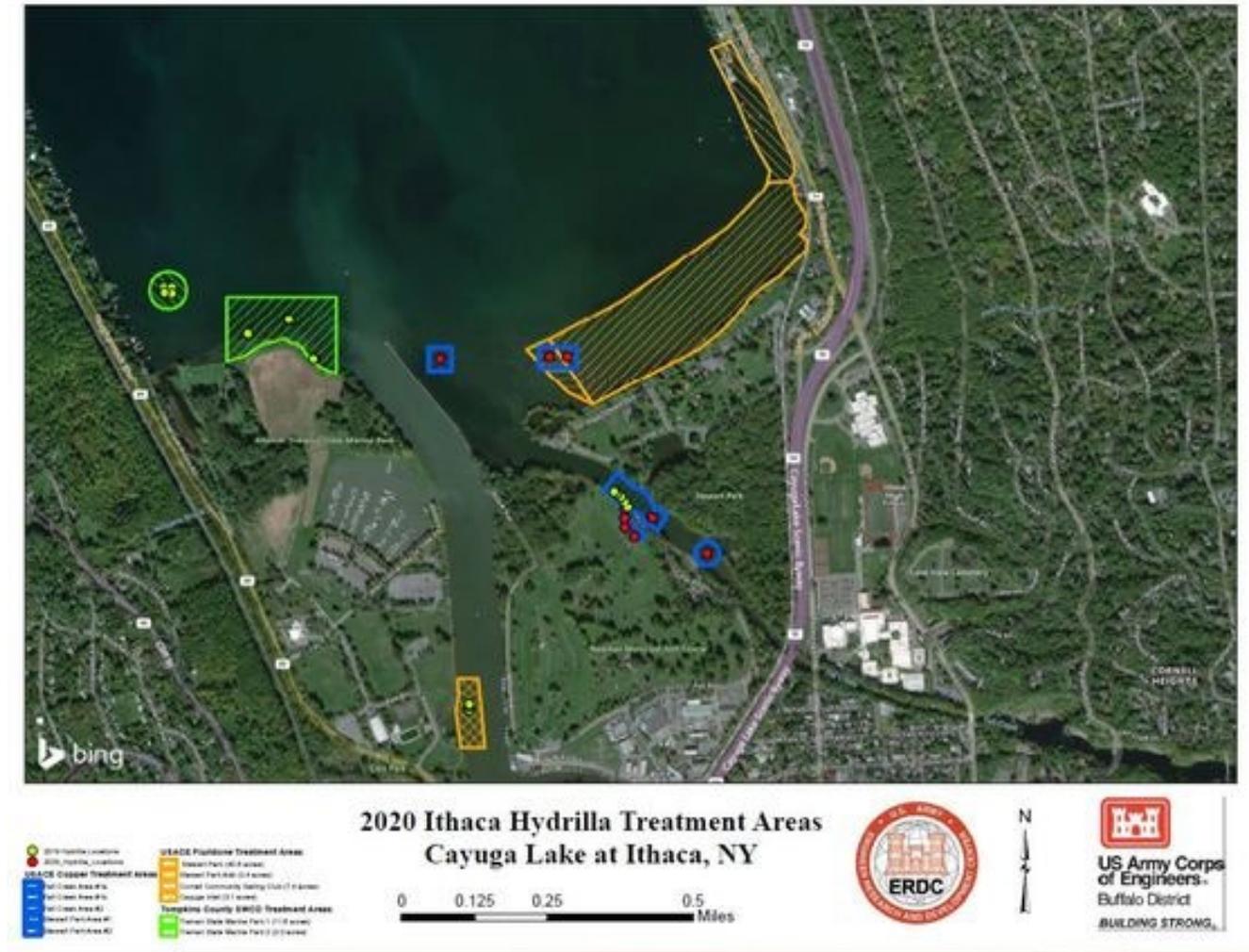


Hydrilla is an invasive water weed, also known as “water thyme” and is one of the world’s most invasive aquatic plants (NYSDEC, 2020). Signs of this species has been document in Cayuga Lake and Tompkins County as early as 2011 and was originally found in Orange County NY in 2008. The weed can grow up to an inch per day and as a result produces dense mats of vegetation that can prevent sunlight from entering the waters and absorbs oxygen, causing uninhabitable aquatic environments. Waterfront communities, like Tompkins County are vulnerable to potential economic impacts as well since this species can degrade the overall waterbody and devalue waterfront property and hinder tourism activity. Due to this weed having effects across the nation, Hydrilla has been designated as a federally listed noxious weed which prohibits any movement between states and other countries. While the DEC has its own preventative measures in place, Tompkins County has also created a taskforce under the Tompkins County Soil & Water Conservation District to eradicate or control Hydrilla in local waterways (Cornell Cooperative Extension, 2020). The taskforce cooperates with the Buffalo



office of the Army Corps of Engineers to treat hydrilla annually. The adjacent map shows treatment efforts documented in Tompkins County by the ACOE in 2020.

Figure 5.4.6-3. Hydrilla Treatment Areas, Cayuga Lake, Ithaca, NY



Sirex Woodwasp (SW) is an invasive insect that attacks pine species, including Scots Pine and Red Pine. It was found in Oswego County in 2004 and since then has spread throughout much of New York State. It is known for causing severe tree mortality as it lays its nests and inserts a fungus into distressed trees, which ultimately lead to the trees wilting and rotting, however thus far it has not been negatively impacting pine species as bad as initially thought.

Giant Hogweed is a perennial plant and a member of the carrot family. It is a garden ornamental from southwest Asia that is naturalizing in North America and has over time become a widespread issue in New York State. Giant hogweed has the potential to spread readily and grows along roadsides, ditches, and streams. It invades old fields and native habitats such as open woodlands. Brushing against or breaking the plant



releases sap that, combined with sunlight and moisture, can cause a severe burn within 24 to 48 hours. Giant hogweed is a Federally listed noxious weed and NYS law prohibits its possession with the intent to sell, import, purchase, transport, introduce or propagate (NYSDEC, 2020). Giant hogweed has been spotted in Caroline, Danby, Dryden, Enfield, Hector, Lansing, Newfield, Trumansburg, and Ulysses. Dryden and Trumansburg are new additions as of 2018, though the plant is relatively under control (Cornell Cooperative Extensions, 2020). New York State has a Giant Hogweed eradication program that is active in the Finger Lakes region.

Wild Parsnip is an invasive plant from Europe and Asia that has become naturalized in North America. The plant can grow up to five feet tall and has a hollow grooved stem. The plant can easily be mistaken for plants such as goldenrod or other flowering yellow plants that can be found in the northeast region. It is well suited for the northeast climate and can be found in a broad range of habitat, especially along roads, in field and pastures, and along rivers or streams. The plant contains a chemical called furanocoumarins which cause human skin to become vulnerable to UV and thus cause swelling and inflammation. The burn can last between 24 and 48 hours and in severe cases cause discoloration of the skin. Tompkins County and its associated organizations such as Cornell Cooperative Extension and SWCD are actively monitoring the species and have been providing education and outreach around the potentially hazardous plant (Cornell Cooperative Extension, 2020)

White Tailed Deer is a native species to North America, however the population in New York has become quite abundant today. Changes to the natural landscape created by humans provide an abundant and ideal deer habitat, which in return has increased the deer population in the State. Substantial deer populations are not only a by-product of agriculture, but the result of greenways and large building lot sizes common in the suburban and rural areas of the State. The overpopulation of white tailed deer is reducing the ability of forests to regenerate, resulting higher vehicle collisions and incidence of Lyme disease. New York State DEC encourages active deer management through a number of its programs.

Hemlock Woolly Adelgid (HWA) is an invasive, aphid-like insect that attacks North American hemlocks. HWA are originally from Asia and is very small and hard to see underneath the branches around the needles. HWA develop by connecting at the base of needles and being feeding on the tree's stored starches which depletes the tree of nutrients and destroys the canopy due to the inability for adequate nutrients to be delivered to the twigs and needles. The tree dies within 4 to 10 years if not addressed immediately. While all hemlock species are vulnerable, most often HMA can be found on eastern (most common in NYS) and Carolina hemlocks. In addition to direct effects on hemlock, the decline of the species health can cascade to affecting black bears, salamanders, and migrating birds, as well as unique lichen and

Figure 5.4.6-4 NYSDEC, 2020



plant communities that all depend on the unique dense canopy of the hemlock. Hemlocks are the dominant species on the steep slopes surrounding our headwater tributaries. The loss of hemlocks will lead to more erosion in those streams which will have downstream impacts on infrastructure. The lack of hemlocks will also expose the stream to more sun, heating the water. The increased heat and sediment will negatively impact native brook trout and other species.

Asian Longhorned Beetles (ALB) are exotic pests native to parts of Asia, threatening a wide variety of hardwood trees in North America, particularly in New York State, New Jersey, and Chicago. The beetle is believed to have arrived in New York City in the 1980s, in wooden packing material used in cargo shipments from China. The ALB can infest certain hardwood trees, eventually destroying them. They are threat to public, private, and commercial hardwood trees. The U.S. Department of Agriculture (USDA) believes this beetle can probably survive and reproduce in most sections of the country where suitable host trees exist.

This insect is native to the southeastern United States but has been expanding its range up the Eastern Seaboard in recent years. Warming of extreme winter temperatures has most likely contributed to this expansion. While this species has not yet been documented in Tompkins County, according to DEC, with changing weather patterns and increasing temperatures, the Finger Lakes region will likely start encountering this species in the near future. The USDA APHIS eradication measure have helped to keep this pest from spreading.

Spotted lanternfly (*Lycorma delicatula*) is an Asian plant hopper. The adults are quite colorful with a black head, grayish black spotted forewings, and reddish black spotted hind wings (see Figure 1). Adults are approximately 1" in length and a 1/2" in width and are present from mid-July through the fall. During this time, SLF adults are mating and laying eggs. Egg masses are laid on smooth surfaces and appear like a patch of mud. The spotted lanternfly has major adverse impacts to wineries. It was recently spotted in 2020 in the City of Ithaca.

Regulations

The Invasive Species Council is a statutory body created in 2008 by Title 17, Section 9 of the Environmental Conservation Law (ECL). It was created to coordinate among multiple state entities and partners in addressing 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: the Commissioners of the NYSDEC; NYSDAM; Transportation; 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, 2020).

The NYSDEC, in cooperation with the Department of Agriculture and Markets, has proposed invasive species regulations (6 NYCRR Park 575). The proposed regulation includes a list of prohibited species which shall be



unlawful to knowingly possess with the intent to sell, import, purchase, transport or introduce; a list of regulated species which shall be legal to possess, sell, purchase, propagate, and transport, but may not be knowingly introduced into a free-living state; and require 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 used in making such classifications and a means for future classification of species. The regulation establishes grace periods for certain prohibited species to allow businesses to plan the management of existing stock (NYSDEC, 2020).

Extent and Location

The extent and location of infestations and invasive species depends on the preferred habitat of the species, as well as the species' ease of movement and establishment. However, each of these threats can impact most areas of New York State, including Tompkins County.

Giant Hogweed

The species has been documented across the state including Tompkins County. The plant grows along streams and rivers and in fields, forests, yards, and roadsides. It prefers open sites with abundant light and moist soils, though it can grow in partially shaded habitats, too. The species is often found as a standalone plant, unlike many invasive species that cluster together. The map depicts the extent to which giant hogweed has been documented, and the adjacent map shows the sites that have been treated and the species was successfully exterminated.

Figure 5.4.6-5 2020 NYSDEC Giant Hogweed Eliminated Plant Sites

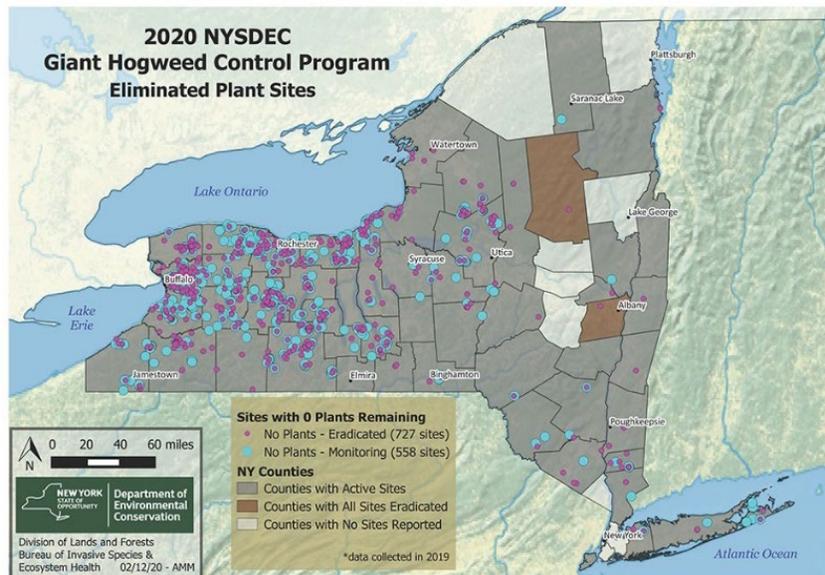
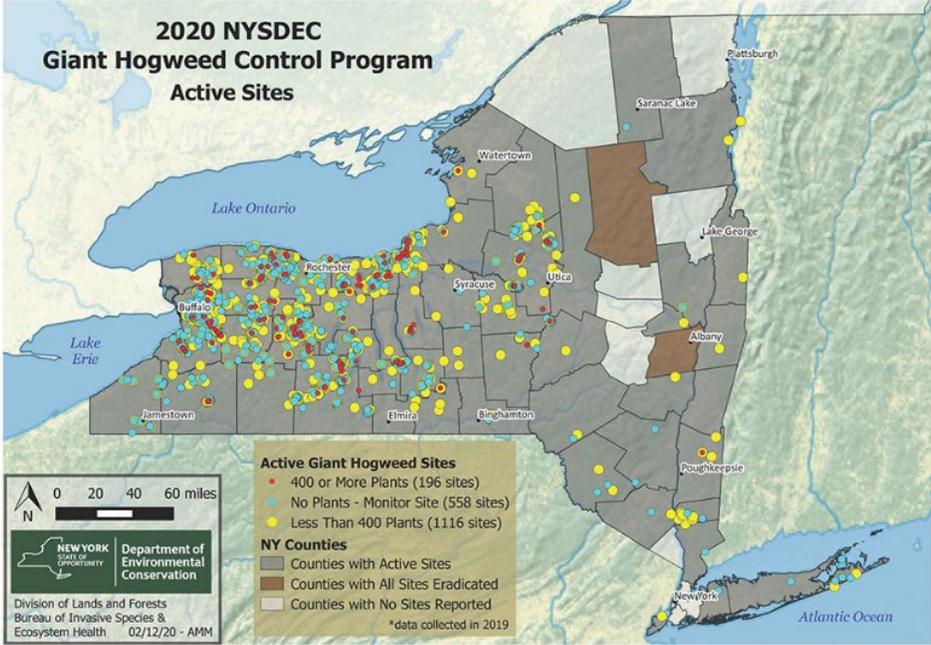


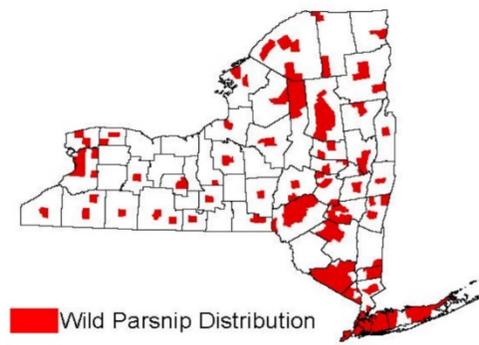
Figure 5.4.6-6 2020 NYSDEC Giant Hogweed Active Sites



Wild Parsnip

The species, like many other invasive plants can be found in large clusters along the side of the roads and can be especially prevalent during the summer months. The plant can be found in most of Upstate New York Counties including Tompkins County. The plant is most likely to be found in areas where sunlight is fully accessible and therefore not in shady areas such as forests. The adjacent map shows the distribution of the wild parsnip in New York State.

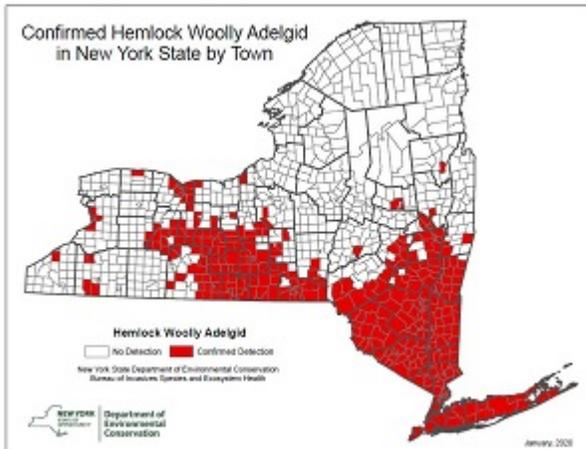
Figure 5.4.6-7 Wild Parsnip Distribution



Hemlock Woolly Adelgid (HWA)

HWA was originally introduced to North America in the 1920s. Ever since, it has spread along the east coast from Georgia to Maine and now occupies nearly half of the eastern range of native hemlocks. It was

Figure 5.4.6-8 Confirmed Hemlock Woolly Adelgid Locations



documented in New York State around 1985 in the Lower Hudson Valley and Long Island and continued upward toward the Capital Region. The species has spread over the years across the state and in 2008 has been documented in Tompkins County (Tompkins County, 2020). The adjacent map shows the extent to which HWA has been documented in New York State (NYS DEC).

*Emerald Ash Borer (EAB)*As previously mentioned, EAB can be found across the state and have been identified in much of Upstate New York including Tompkins County. However, no active mitigation measure is in place at this time (NYSDEC, 2020).

Garlic Mustard (GM)

The plant is ubiquitous in Tompkins County and readily established in recently disturbed areas.

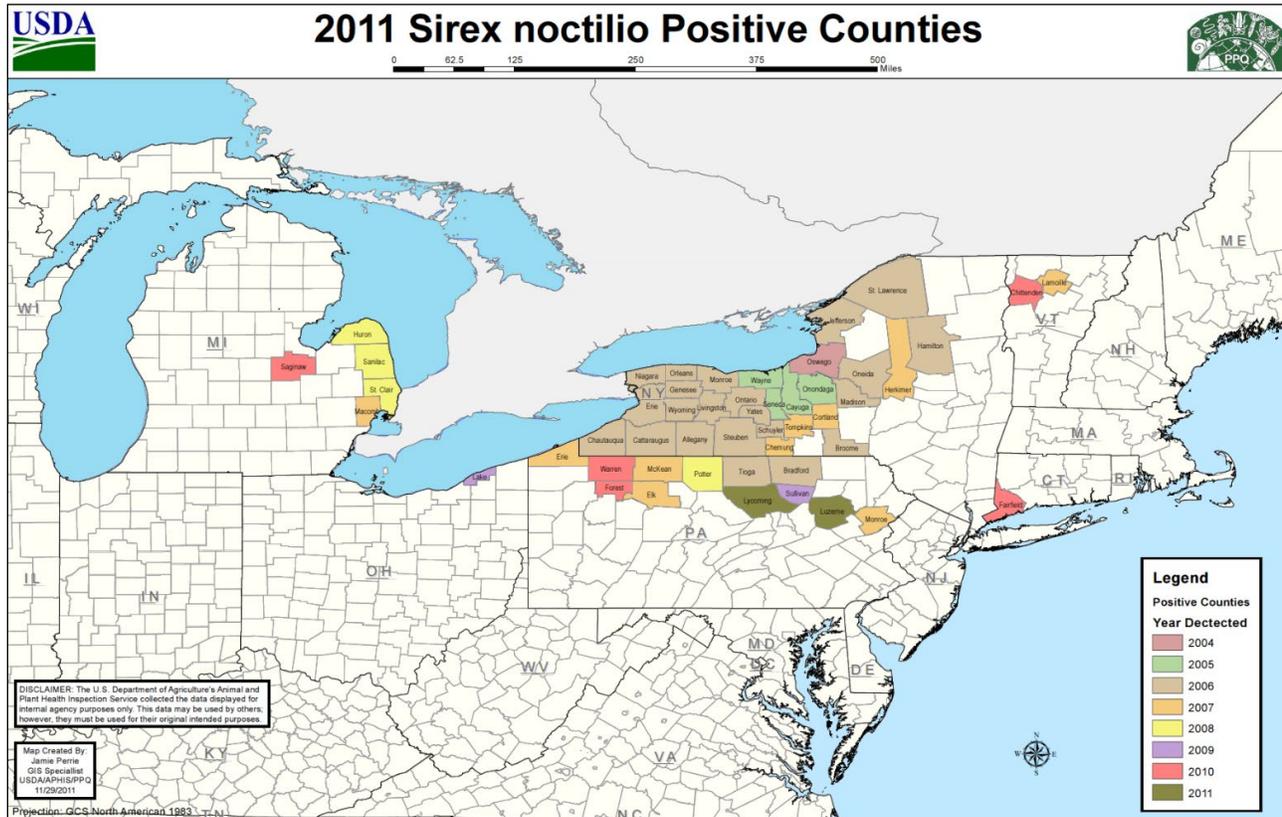
Sirex Woodwasp (SW)

The species is native to Europe, Asia, and North Africa. It can now be found within the northeast U.S. ranging from Michigan to New Hampshire. In New York State, the most affected species are scots pine, Austrian pine, and red pine from plantations dating to the mid-1900s. The damage to the underperforming trees has a minimal economic effect to the state (NYIS, 2019). It was found in Oswego County in 2004 and since then has spread throughout much of New York State, including Tompkins County. The USDA Forest Service ranks Tompkins County as having a medium to very high introduction potential, establishment potential, and susceptibility potential for Sirex Woodwasp infestations (USDA Forest Service, 2006).

Figure 5.4.6 9 shows the positive counties in New York State where Sirex Woodwasp has been detected. According to this figure, as of 2011, Sirex Woodwasp has been documented in Tompkins County. Available information regarding the identification of the species in Tompkins County is provided below.



Figure 5.4.6-9. *Sirex Woodwasp* in New York State.



Source: New York State Invasive Species Clearinghouse, 2019

Spotted Lanternfly

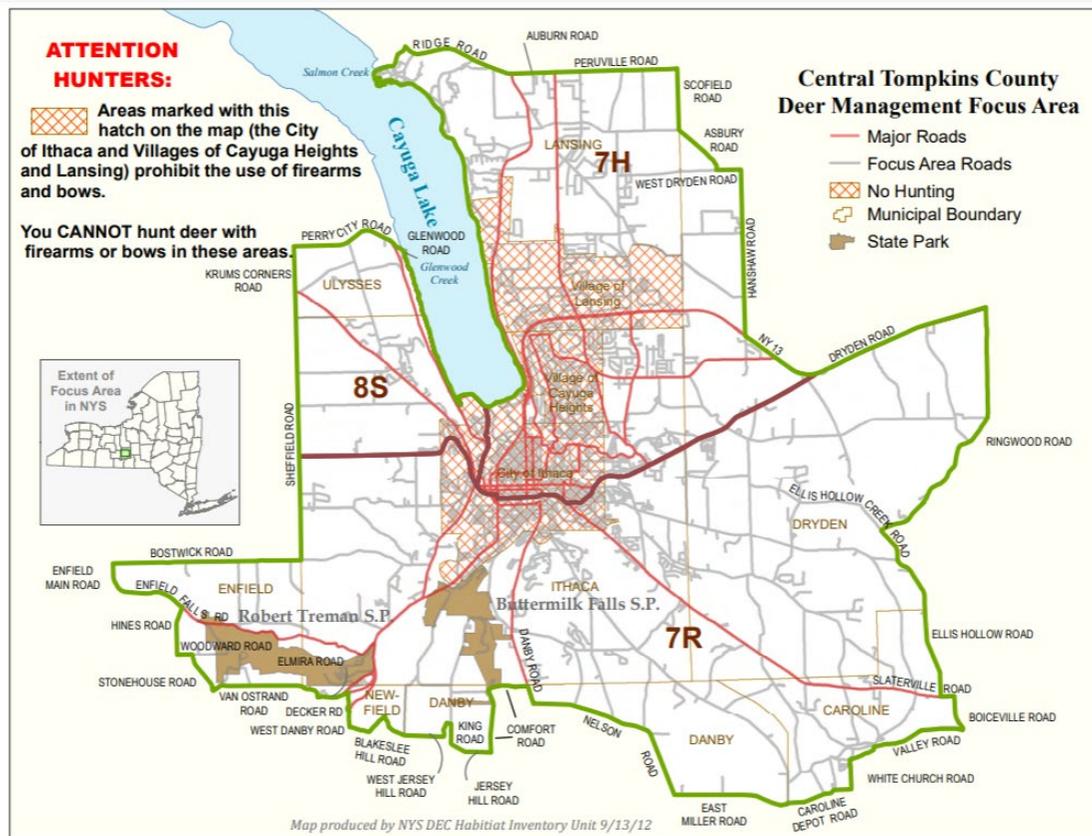
Spotted Lanternfly was just recently found in the fall of 2020 in Tompkins County, in the City of Ithaca’s Fall Creek neighborhood. The New York State DEC is proactive in combatting the species and has established a protective zone that includes the following counties: Bronx, Broome, Chemung, Chenango, Delaware, Dutchess, Greene, Kings, Nassau, Orange, Otsego, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Tioga, Ulster and Westchester. This zone was established to actively monitor communities near the Pennsylvania and New Jersey boundary and eradicate any reported cases of the spotted lanternfly.

White-Tailed Deer (WTD)

Tompkins County has faced substantial deer issues, with communities such as Cayuga Heights, the Town of Ithaca, and Cornell University convening leaders to discuss deer management solutions. In suburban areas, deer populations have been increasing due to land development and opposition to hunting. The impacts of deer overabundance can be shown by the number of deer/automobile collisions, destruction of residential flower and shrub plants, damage to agricultural crops, and increased risks of contracting wildlife-transmitted diseases such as Lyme disease (discussed in Section 4.3.2, Disease Outbreak).



Figure 5.4.6-10: Deer Management Focus Areas



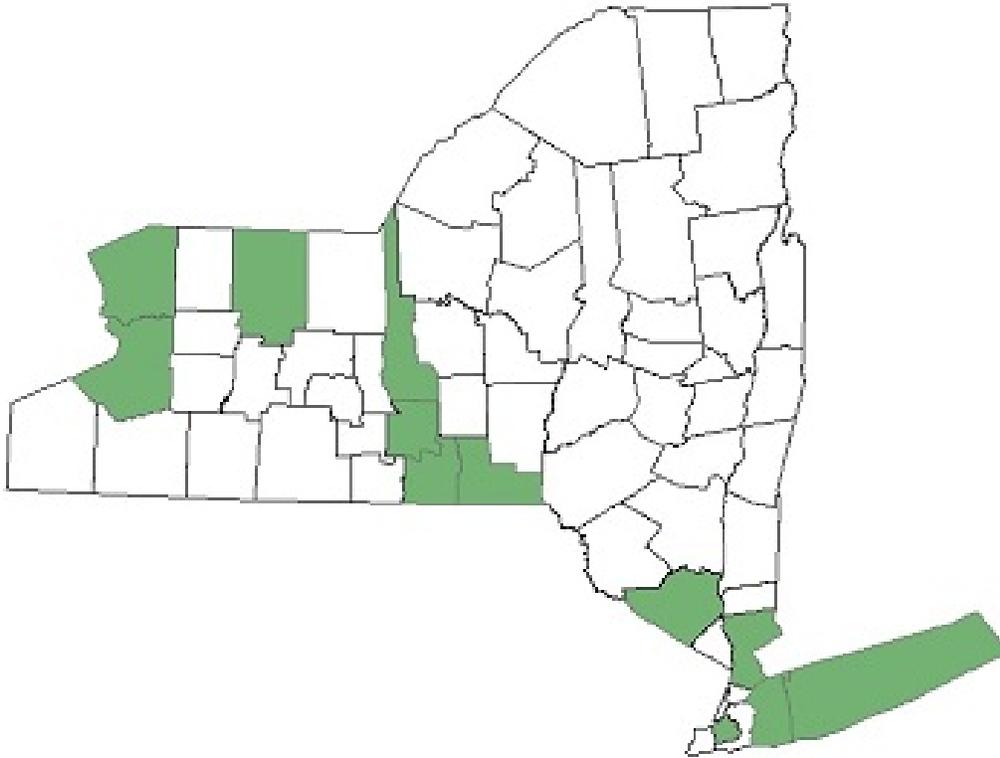
Source: NYSDEC 2020

Hydrilla

The species is only found in aquatic environments and can be documented in several waterbodies in New York State. More commonly it is misidentified and sold as Elodea. It has been used intentionally as an aquarium plant; however, the state actively prohibits the distribution or sale of this species to prevent the spread. As of 2011, based on NYSDEC data, Hydrilla has been documented in Tompkins County, specifically Cayuga Lake at the King Ferry and Finger Lakes Marinas, Village of Aurora, Merrill Sailing Center, Stewart Park, and locations along the south east and west shore, as well as in the lower section of Fall Creek and the Cayuga Inlet and active mitigation measures are being developed by various municipal and non-for-profit entities to reduce the spread of this invasive species (Cornell Cooperative Extension, 2020). DEC began development of one management plan for the various treatment efforts in the area in 2020. DEC will provide leadership in coordinating the various efforts in 2021. DEC is also planning to hire a strike team for monitoring and rapid response. The adjacent map depicts the counties in which Hydrilla has been documented in New York State.



Figure 5.4.6-11. Current Known Distribution of Hydrilla in New York State



Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with infestation events throughout New York State and Tompkins 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 1954 and 2020, FEMA declared that New York State experienced one infestation-related emergency (EM) classified as a virus threat. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations. Tompkins County was included in this declaration (FEMA, 2020).

In addition, because invasive species can sometimes go unrecorded and the number of occurrences can be unclear, it can be easier to understand the time in which the identified species was first documented in the region.



Table 5.4.6-1. Identified Invasive Species in Tompkins County

Species	Status
Hydrilla	Identified
Giant Hogweed	Increasing number of occurrences in county
Spotted Lantern Fly	Recently Documented in City of Ithaca (2020)
Sirex Woodwasp	Documented in Otsego in 2004
Garlic Mustard	Originally Documented in 2015
Emerald Ash Borer	Documented in Tompkins County
Hemlock Woolly Adelgid	Originally documented in region in 2008
Wild Parsnip	Increasing number of occurrences in County
Asian Longhorned Beetles	Not Yet Documented in Tompkins County

Asian Longhorned Beetle (ALB)

The spread of ALB to other tree populations should be preventable if USDA quarantine restrictions are followed with the ongoing monitoring of area trees for rapid detection of beetle infestations. According to the USDA APHIS, surveys, regulatory measures, and control that the ALB problem can and should be eradicated. However, the USDA also indicates that if this beetle continues to spread, potential damage is significant throughout the U.S., including New York State.

Sirex Woodwasp

The USDA Forest Service ranks Tompkins County as having a medium to very high introduction potential, establishment potential, and susceptibility potential for Sirex Woodwasp infestations (USDA Forest Service, 2006).

Garlic Mustard (GM)

This species has been continuing to infest the Finger Lakes region and, according to DEC, the species is under strict monitoring. Climate Change could change the overall conditions and lead to spreading of this species.

Wild Parsnip

This species has been continuing to infest the Finger Lakes region and, according to DEC, the species is under strict monitoring. Proper education and outreach will need to be conducted, as with climate change eradication of this species is unlikely.

Hydrilla

Tompkins County has been proactive in combatting and implementing strict guidelines to decrease hydrilla. Current efforts could lead to decreased levels of this species. However, at the same time, with changing climate and land use patterns, there is no guarantee that the existing mitigation measures will continue to a decline in hydrilla. The lack of effective boat spread control will lead to a significant problem. With projected changes, the probability occurrence for hydrilla will likely increase.



Giant Hogweed

This species has been continuing to infest the Finger Lakes region and, according to DEC, the species is under strict monitoring. Proper education and outreach will need to be conducted, as the prevalence of this species and its spreading will likely increase.

White-Tailed Deer

Current white-tailed deer levels have been improving over time in Tompkins County and New York State, as the DEC and county have been proactive in species management. With continued measures, the region will likely see a drop in the number of white-tailed deer (NYS DEC, 2020).

Spotted Lantern Fly

At this time, the species is still spreading across the state and whether the species will continue to increase is still unknown. However, if current trends continue, Tompkins County will likely see an increased presence of this species over time (NYS DEC, 2020).

Emerald Ash Borer

Currently there are some County-wide mitigation measures in place to combat this species spread. Also, Cornell University is proactively treating with biocontrol releases, inventorying, and culling ash trees to manage the impact of the thousands of on- and off-campus trees that have succumbed to this insect and could become a life-safety concern as they fail. (Cornell Chronicle, 2020). This program could provide a basis for a larger, regional program. Unless mitigation actions are taken by the state and County, the species will likely continue to increase its presence in Tompkins County and the Finger Lakes Region.

Hemlock Woolly Adelgid

The HWA has been rapidly spreading across the State and there are no signs of this decreasing. While New York State is currently actively trying to mitigate the spread of this species, with climate change this species will likely continue to increase and reach northern counties over the years (NYSDEC, 2020).

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. (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).

Probability of Future Occurrences

Based on historical documentation, increased incidences of infestation throughout New York and the overall impact of changing climate trends, it is estimated that Tompkins 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 lack of enforcement and regulatory approaches to stop the spread poses a significant concern.](#) The Planning Partnership views this as a “frequent” hazard of concern (hazard event that occurs from once in 10 years to once in 100 years) and will lead to cascading hazard impacts.

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). Added resources are also available from the NE Regional Invasive Species and Climate Change Management network: <https://www.riscnetwork.org/>.

Temperatures and precipitation amounts are expected to increase throughout the State, as well as in Region 3. It is anticipated that by the 2020s, the State’s temperature will rise between 1.5 and 3°F; 3 to 5.5°F by the 2050s; and 4 to 9°F by the 2080s. The lower ends of these ranges are for lower greenhouse gas emissions scenarios and the higher ends for higher emission scenarios (NYSERDA, 2011).

In Region 3, it is estimated that temperatures will increase by 3.5°F to 5.5°F by the 2050s and 4.5°F to 8°F by the 2080s (baseline of 46°F). Precipitation totals will increase between 0 and 10% by the 2050s and 5 to 10% by the 2080s (baseline of 38 inches). While precipitation totals will increase they will likely also be highly variable resulting in more flooding and drought. Table 5.4.8-6 displays the projected seasonal precipitation change for the Southern Tier ClimAID Region (NYSERDA, 2011).

Table 5.4.6-2. Projected Seasonal Precipitation Change in Region 3, 2050s (% change)

Winter	Spring	Summer	Fall
+5 to +15	0 to +15	-10 to +10	-5 to +10

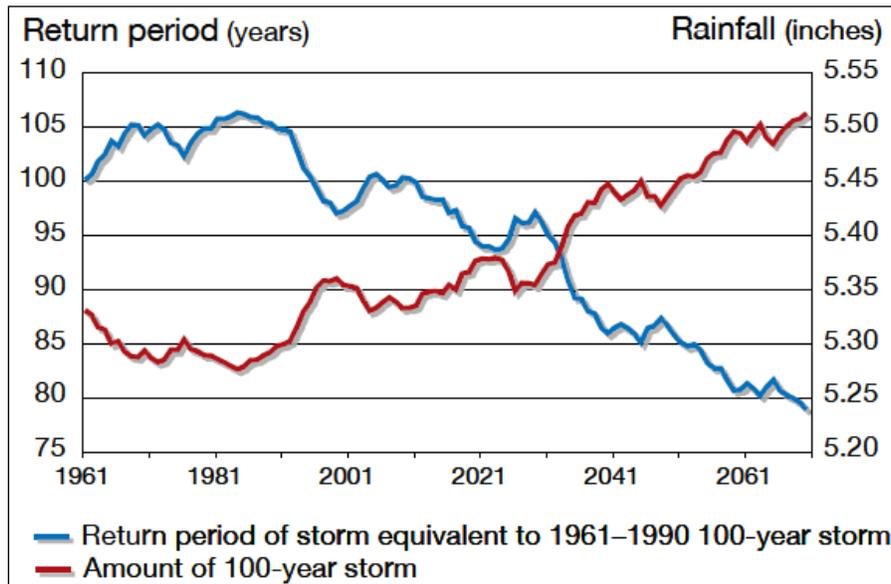
Source: NYSEDA, 2011

Since the start of the twentieth century, annual temperatures in New York State have been rising. State-average temperatures have increased by approximately 0.6°F since 1970, with winter warming exceeding 1.1°F per decade. Extreme heat events are likely to increase throughout New York State and short-duration warm season droughts will become more common.

Figure 5.4.8-11 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 5.4.6-12. Projected Rainfall and Frequency of Extreme Storms



Source: NYSERDA, 2011

Total precipitation amounts have slightly increased in the Northeast U.S., 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 (Cornell University College of Agriculture and Life Sciences, 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 U.S. 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).

5.4.6.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable. For the infestation and invasive species hazard, the entire County is exposed. Therefore, the following sections discuss Tompkins County’s vulnerability, in a qualitative nature, to the infestation and invasive species hazard.



Impact on Life, Health and Safety

Of that vulnerable population, the elderly population and people with suppressed immune systems are most susceptible to the effects of things like Lyme Disease which is exacerbated by infestation and invasive species. The ACS has identified that there are 13,561 persons over the age of 65 in Tompkins County.

As discussed earlier, infestations can have an impact on agricultural commodities. The NYSDEC has indicated that agricultural commodities are at risk of becoming infested with invasive species, such as the spotted lanternfly, gypsy moth, and hemlock wooly adelgid (NYSDEC 2020, NYSDEC 2020b, NYSDEC 2020c, NYSDEC 2020d, NYSDEC 2020e, NYSDEC 2020f). Agricultural goods and services may include consumable resources sold to persons throughout the County. Not only can the livelihood of farmers become affected by crops that are infested, consumers of the goods and services that are infested will also be impacted.

The entire population of Tompkins County is vulnerable to infestation and invasive species outbreaks. Individuals most vulnerable to Infestation and Invasive Species include those: Over 65 years old, with suppressed immune

Impact on General Building Stock

No structures are anticipated to be directly affected by infestation or invasive species; however, the emerald ash borer and hemlock wooly adelgid (impacts many hemlocks along ravines and in gorges) may cause a catastrophic loss of ash trees throughout the County, which could result in stream bank instability, erosion, and increased sedimentation, impacting ground stabilization and possibly cause foundation issues for nearby structures. Additionally, with an increased number of dead trees, there is an increased risk of trees falling on roadways, power lines, and buildings.

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 have been known to clog culverts and streams, increasing flooding risk.

Impact on Community Lifelines

Water treatment plants could be impacted by infestation and invasive species (and Harmful Algal Blooms as identified as a separate hazard) because of similar issues that the general building stock may experience. Water that becomes polluted due to increased sedimentation and erosion will require additional treatment. If the system becomes clogged with these pollutants, the ability of water treatment plants to operate may become impaired. Additionally, soil that becomes unstable due to decaying vegetation can impact critical facilities that are built on or around these soils.



Impact on 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 available documentation. However, since 2016, the Department of Environmental Conservation (DEC) Invasive Species Grant Program has awarded approximately \$6.5 million to 114 municipalities, non-profit, and academic institutions to address the issue of invasive species including measures of control, removal, additional research, and prevention techniques (NYDEC 2020). Infestation and invasive could further adversely impact tourism, property values, and outdoor recreation opportunities.

In 2018, DEC and the NYS Department of Agriculture and Markets (DAM) developed a Final Invasive Species Comprehensive Management Plan (NYDEC 2020f). This plan highlights some of the major programs that have been established for invasive species control for the State. According to the plan, up to \$13.3 million has been raised to manage the impacts of invasive species by the NYS Environmental Protection Fund (NYSDEC 2018b). While helpful, this level of funding is insufficient to effectively managing these issues.

Impact on the Environment

As previously discussed, Tompkins County's parks, forests and neighborhood trees are vulnerable to gypsy moth, spotted lanternfly, hemlock wooly adelgid and the emerald ash borer. In addition, a high population density of deer and the amount of browsing can have detrimental effects on the forest communities in the County, including County owned forest land. Other broad ranging impacts can be had on aquatic species and fish communities.

Invasive species can 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 a steep slope. Aquatic invasive species alter the food web and can disrupt fisheries and degrade water quality.

Cascading Impacts to Other Hazards

Infestation and invasive species outbreaks could exacerbate the impacts of harmful algal blooms and erosion events within the County's karst topographic regions. Soil destabilization caused by destruction of roots and plants can increase the runoff into Cayuga Lake. This may also create erosion along the lake's banks and gorges. Refer to Section 5.4.5 and Section 5.4.7 for more information about the harmful algal bloom and flood hazards of concerns, respectively.



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

As discussed in Sections 4 (County Profile) and 9 (Jurisdictional Annexes), areas targeted for future growth and development have been identified across Tompkins County. 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.

Projected Changes in Population

According to population projections from the Cornell Program on Applied Demographics, Tompkins County will experience a continual population increase from 2020 through 2040 (over 6,040 people in total by 2040). The U.S. Census Bureau also shows that the population in Tompkins County has increased 0.6-percent between 2010 and 2019 (U.S. Census Bureau 2020). Any growth can create changes in density throughout the County, which can affect the location of future development projects. As a result, habitat changes can impact the distribution of natural wildlife to mitigate against infestation and invasive species.

Furthermore, infestation to cropland can have a wider impact on persons outside of Tompkins County if the farmers within the County supply resources to neighboring communities. Being aware of trends occurring around the County may reveal that infestations within agricultural commodities provided by the County impacts a greater number of persons.

Climate Change

Climate change could exacerbate the impacts of these species in the County. As mentioned above, changing weather patterns could create a change in the migration patterns for when these species move into and out of Tompkins County. If the species have a more prolonged existence in the County, there may also be a greater number of infestation events or a higher value of loss tied to infestation.



Change of Vulnerability Since the 2014 HMP

In the Tompkins County's 2014 Hazard Mitigation Plan, the County assessed agricultural driven epidemic events as a hazard of concern. The infestation and invasive species hazard of concern is a counterpart to the agricultural driven epidemic hazard. This updated hazard mitigation plan uses more recent population information and research of infestation and invasive species to assess the County's change in risk to this hazard of concern. Overall, the entire County continues to remain vulnerable to the infestation and invasive species hazard.

Identified Issues

- 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 further cause devastating impacts to the agricultural industry in Tompkins County, leading to crop losses. EAB is also 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. 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. These impacts further threaten aspects of local tourism.
- The current Cornell University Ash Tree Program which includes a phased approach to monitor, inventory, treat, harvest, and replant trees may provide a basis for a regional program address the cascading safety issues presented by the infestation of Emerald Ash Borers.

