St. Lawrence Eastern Lake Ontario Partnership for Regional Invasive Species Management

2016 Field Survey

Hemlock Wooly Adelgid (*Adelges tsugae*)

SLELO-PRISM Early Detection Surveillance

August 17th – 29th, 2016

Report prepared by Ashley Gingeleski and Ben Hansknecht on September 12th, 2016

Figure 1. Stand of eastern hemlock trees. Photo by Ashley Gingeleski.

Introduction and Background[1]

Hemlock woolly adelgid (*Adelges tsugae*), native to Asia, is a small, aphid-like insect that threatens the health and sustainability of eastern hemlock (*Tsuga canadensis*) (**Figure 1**). Hemlock woolly adelgid (HWA) was first discovered in the United States in 1951 near Richmond Virginia, and has since spread throughout the northeastern US and into the Midwest. Decline and mortality of hemlock after an infestation typically occurs between 4 and 10 years. Hemlocks stressed by drought, poor site conditions, disease, and other insect pests will show accelerated rates of mortality.

HWA is active in cooler months and dormant during the summer, producing two generations per year. There are six developmental stages for HWA: the egg, four nymphal instars known as crawlers, and immobile adults. The crawlers are a dark reddish-brown to purple-black in color and are typically found along the branches of hemlock. These crawlers will attach to the base of a needle, feed, and loose mobility. Adults are less than one 16th of an inch long at maturity and produce a wool-like wax filament on the underside of branches to protect itself and its eggs (**Figure 2**). The sticky, waxy covering produced allows for the eggs to spread by attaching to deer, birds, other forest dwelling mammals, and by the wind.

Figure 2. Woolly egg masses produced by hemlock woolly adelgid on eastern hemlock tree branch. Photo by Elizabeth Willhite, USDA Forest Service, Bugwood.org.

[1] Introduction and Background edited from the 2015 SLELO-PRISM Hemlock Wooly Adelgid Survey, by Ben Hansknecht and Caitlin Muller: http://www.sleloinvasives.org/wp-content/uploads/2015/06/HWA-2015-Report.pdf

This insect feeds directly from the storage cells of hemlocks, causing the needle death and progressing to twig and branch death. The needles loose color becoming yellow and grey, while drying out and falling from the tree. As the insect's feeding progresses, the terminal buds, which produce new shoot growth, will die. Within two years this dieback can be observed in major limbs. The decline in hemlock typically occurs first from the bottom limbs before continuing upward toward the top of the tree.

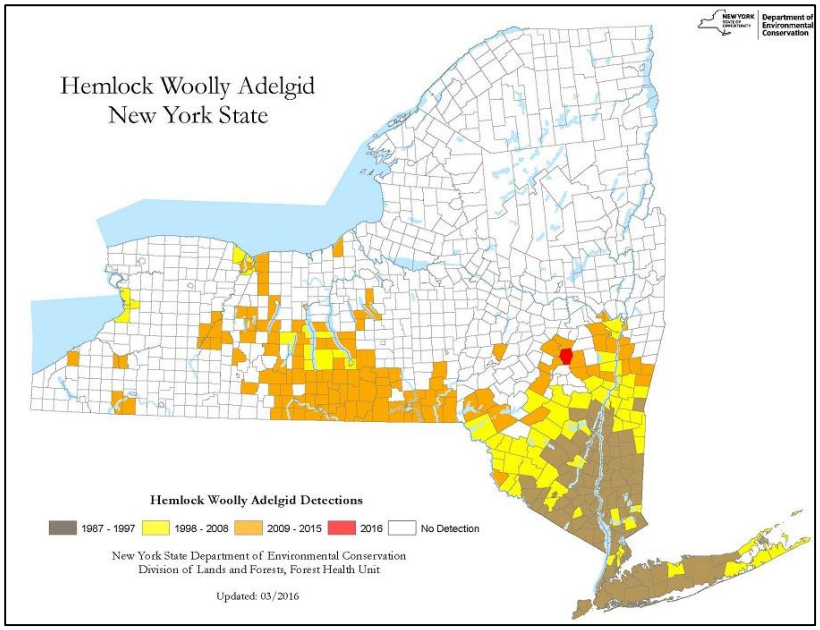

Figure 3. Map of hemlock woolly adelgid detections in New York State. Map by the NYS Department of Environmental Conservation, http://www.dec.ny.gov/animals/86382.html.

HWA has been observed in Cayuga and Onondaga Counties, which border the SLELO-PRISM (**Figure 3**). This species is considered a "Watch-list" species, whose arrival could be detrimental to the ecosystems found within the PRISM.

One area of special concern is the southern Tug Hill Region. Eastern Hemlock is ecologically important, as it is frequently found along exposed slopes, protected gorges, and streams (**Figure 4**). Hemlock creates a cool, damp and shaded environment which supports a wide variety of organisms, including salamanders. Throughout the winter hemlock provides shelter and food for wildlife. Studies of forests damaged by HWA in the southern US have shown that a decline in hemlock populations causes a decline in other plants and animals, producing drastic changes to ecosystem processes.

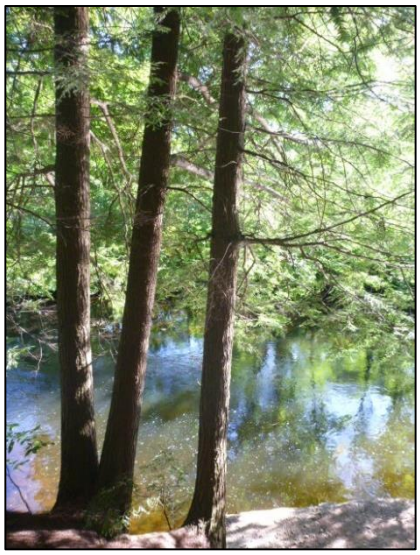

Figure 4. Eastern hemlock trees along stream at Buck Hill State Forest. Photo by Ashley Gingeleski.

Survey Methods and Objectives

The priority conservation area for this survey is the southern Tug Hill region within the SLELO PRISM. Highly probable areas (HPAs) chosen for HWA surveillance in August of 2016 include a variety of popular public recreation spaces. Eleven HPAs were visited and include: Selkirk Shores State Park, Mexico Point State Park, Salmon River Falls, Chateaugay State Forest, Trenton Greenbelt, Penn Mountain State Forest, Clark Hill State Forest, Buck Hill State Forest, Forest Park, Mad River State Forest, and Happy Valley Wildlife Management Area (**Figure 5**).

Figure 5. Highly probable areas (HPAs) chosen as survey sites for hemlock woolly adelgid within the SLELO PRISM.

Figure 6. Dense stand of eastern hemlocks at Chateaugay State Forest. Photo by Ashley Gingeleski.

In 2015, the SLELO Early Detection Team visited these locations to determine points of eastern hemlock growth where dense stands occurred. Points of dense hemlock tree growth were chosen as survey sites because an HWA infestation can easily spread when trees are close in proximity (**Figure 6**). Access to survey sites within each priority conservation area involves the use of hiking trails and/or seasonal roads. A Garmin handheld GPSMAP® 62 was used to locate survey sites from 2015, as well as to mark new survey sites in 2016 where dense hemlock stands occurred.

At survey sites, the Early Detection Team randomly surveyed 20 eastern hemlock trees within dense tree stands for signs of possible HWA infestations. In most circumstances, 20 trees were surveyed in order to keep the process as consistent as possible. Cases where the number of trees surveyed fluctuates include areas where there are less than 20 trees, or surveys at the beginning of the study before a 20 tree maximum was implemented.

Potential indicators of the presence of HWA include: dieback, loss of needles, needle discoloration (**Figures 7-11**). Surveying involved looking at multiple hemlock branches close to the ground on each tree, as well as using a pair of binoculars to survey higher hemlock branches that were out of reach. Any indications of possible reactions to an HWA infestation were recorded.

Figures 7-11. (Clockwise from top left) total needle loss; severe needle loss; moderate needle loss; needle discoloration at tips of branches; needle discoloration throughout branch. Photos by Ashley Gingeleski.

Figures 12 and 13. (Left to right) Spider egg on hemlock branch; spider web on hemlock branch. Photos by Ashley Gingeleski.

Due to the survey taking place in late summer, the use of visible cotton-like egg masses as an indicator for HWA was not possible. In addition, spider eggs and webs can sometimes be mistaken for egg masses, and the team made sure to recognize these as non-threatening attributes of hemlock tree needles (**Figures 12 and 13**). Future hemlock woolly adelgid surveillance efforts should take place any time from October until June, when the cotton-like egg masses from HWA are readily visible.

Observations

Indicators of the potential presence of HWA were recorded at: Selkirk Shore State Park, Chateaugay State Forest, Trenton Greenbelt, Forest Park, Mad River State Forest, Happy Valley Wildlife Management Area.

Figure 14. Bare lower branches on an eastern hemlock tree. Photo by Ashley Gingeleski.

Bare lower branches and dieback were observed at: Selkirk Shores State Park, Trenton Greenbelt, Forest Park, Mad River State Forest, Happy Valley Wildlife Management Area (**Figure 14 and Tables 1, 5, 9, 10, and 11**). Moderate to severe loss of needles were observed at: Selkirk Shore State Park, Chateaugay State Forest, Trenton Greenbelt, Forest Park (**Tables 1, 4, 5, and 9**). Discolored needles were observed at Selkirk Shores State Park and Forest Park (**Tables 1 and 9**).

Drought conditions were observed in August 2016 in Oswego County and Oneida County, where the priority conservation areas for this survey are located. According to the DEC, Oswego County was in a drought warning and Oneida County was in a drought watch at the time of this study (**Figure 15**).[2] Periods of drought can cause stress in hemlock trees and can accelerate declines in health for trees affected by HWA.[3]

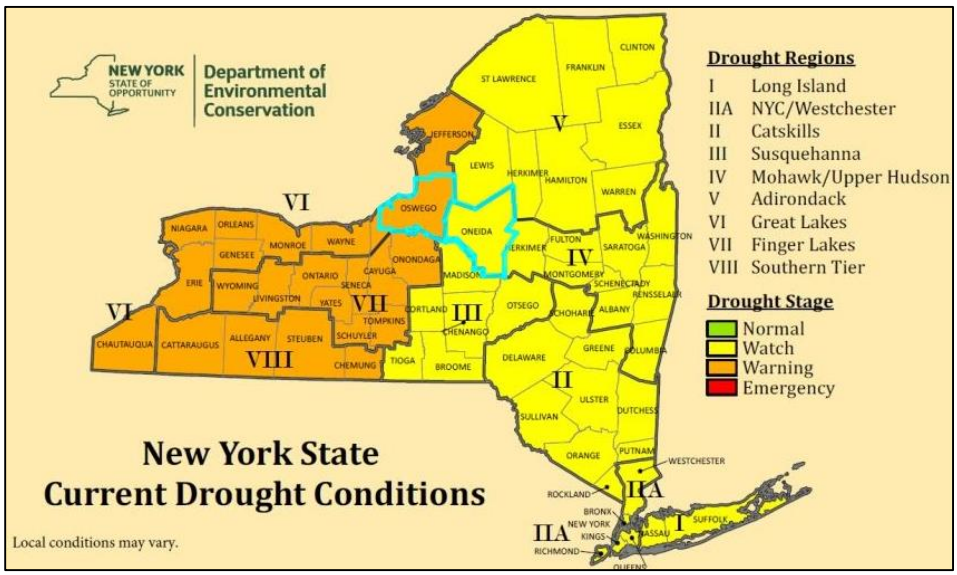

Figure 15. DEC drought condition map for New York from September 12th, 2016 with Oswego and Oneida counties highlighted in light blue.

Follow-up visits to the areas where potential indicators of HWA were noted should take place at some point between October and June. This will allow for easy viewing of woolly egg masses, if HWA is indeed present in these locations.

[2] Map of Current Drought Conditions across New York State, from the Department of Environmental Conservation http://www.dec.ny.gov/lands/5014.html#Current

[3] Eastern Hemlock Forests: Guidelines to Minimize the Impacts of Hemlock Woolly Adelgid, by the USDA Forest Service http://na.fs.fed.us/pubs/tps/eastern_hemlock/eastern_hemlock.pdf

Selkirk Shores State Park: August 17th

Table 1. Hemlock woolly adelgid survey results from Selkirk Shore State Park.

***Highly Probable Area:* Selkirk Shores State Park**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.56243	-76.2003	Red Fox Trail	20	Many have bare branches minus top growth
2	43.56168	-76.1994	Red Fox Trail	20	
3	43.55703	-76.2037	Yellow Forest	41	
4	43.56139	-76.201	Yellow Forest	38	Lots of needles gone
5	43.55117	-76.2081	White Fox	42	
6	43.5517	-76.2052	Green Frog	36	
7*	43.55257	-76.20833	Green Frog	7	Dieback and discolored needles
8*	43.55216	-76.20786	Green Frog	2	Lots of dieback on 1 tree

Key: * = Survey point added in 2016 survey

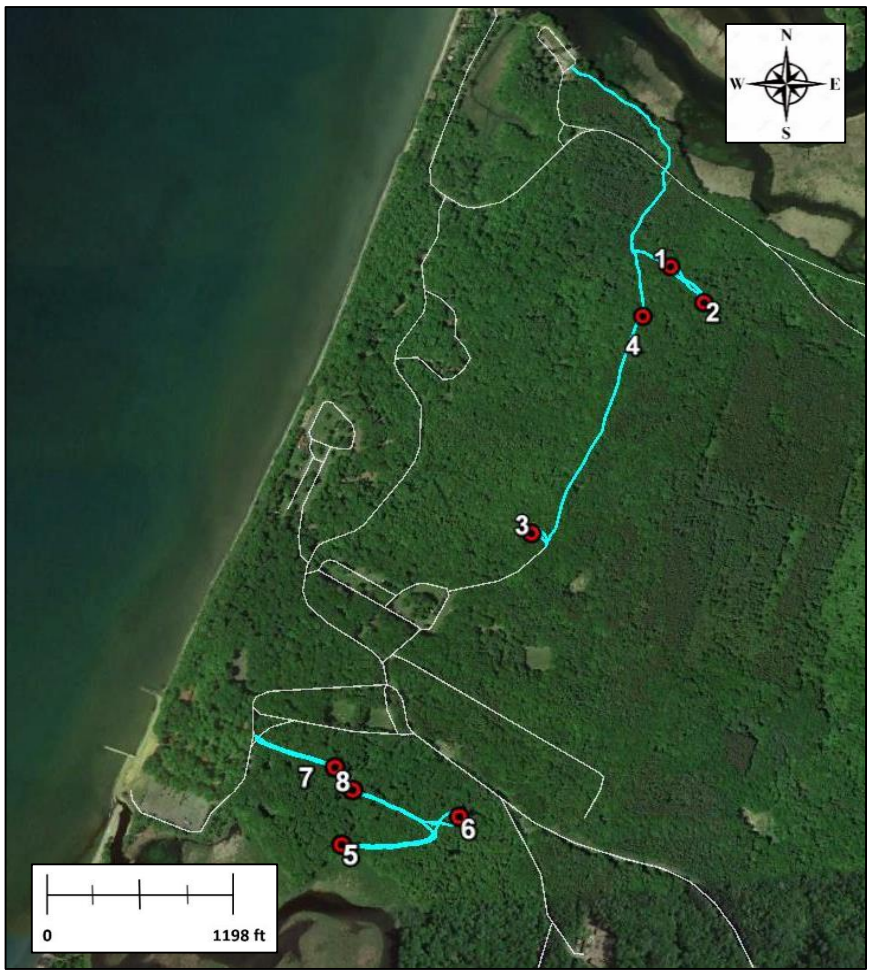

Figure 16. Survey paths at Selkirk Shores State Park.

Parking access for points 1 – 4: Pine Grove Boat Launch in Pulaski, NY.

Parking access for points 5 – 8: Selkirk Shores State Park in Pulaski, NY.

Mexico Point State Park: August 18th

Table 2. Hemlock woolly adelgid survey results from Mexico Point State Park.

***Highly Probable Area:* Mexico Point State Park**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.52245	-76.2592	Roops Loop	20	
2	43.52183	-76.2593	Roops Loop	20	
3	43.5206	-76.2586	Roops Loop	20	
4	43.5198	-76.2573	Roops Loop	20	
5	43.51964	-76.2562	Roops Loop	20	
6	43.52064	-76.2568	Roops Loop	20	

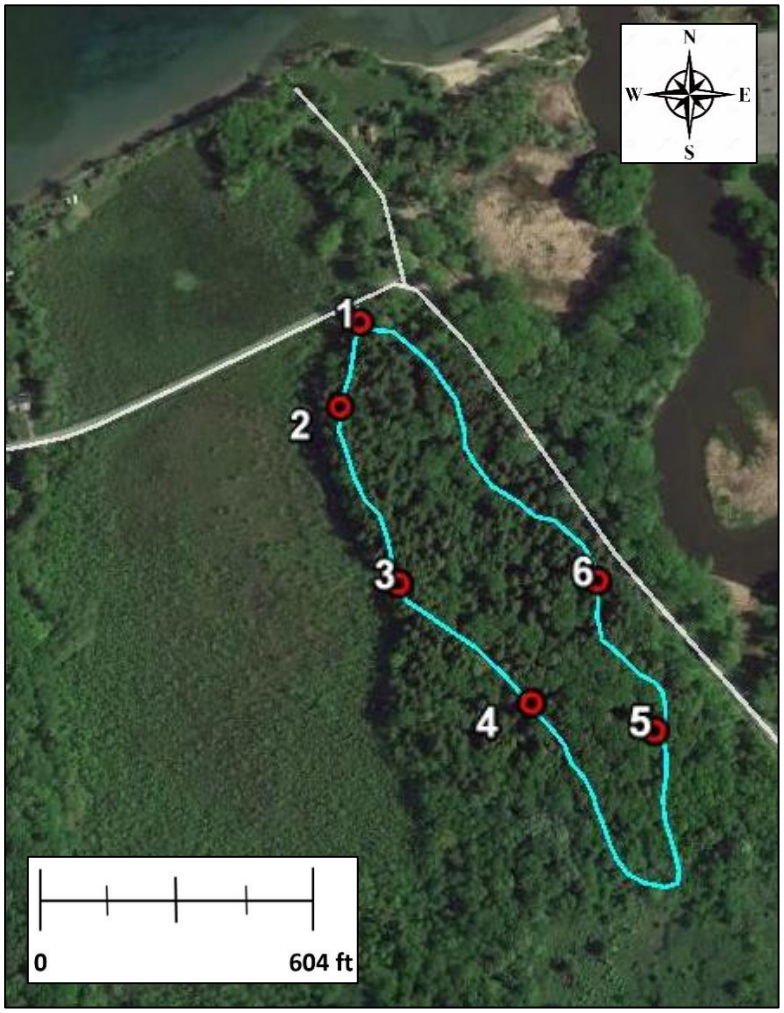

Figure 17. Survey path at Mexico Point State Park.

Parking access for points 1 – 6: Lot for state park off of Mexico Point Drive West in Mexico, NY.

Salmon River Falls: August 18th

Table 3. Hemlock woolly adelgid survey results from Salmon River Falls.

***Highly Probable Area:* Salmon River Falls**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.549022	-75.942753	By Parking Lot	20	
2	43.547636	-75.935794	Along Trail	20	
3	43.547695	-75.934268	Along Trail	20	
4	43.546101	-75.926658	Along Trail	20	
5	43.545738	-75.924079	Along Trail	20	
6	43.545129	-75.921933	End of Trail	20	

Figure 18. Survey path at Salmon River Falls.

Parking access for points 1 – 6: Lot off of Falls Road in Altmar, NY.

Chateaugay State Forest: August 18th and 23rd

Table 4. Hemlock woolly adelgid survey results from Chateaugay State Forest.

***Highly Probable Area:* Chateaugay State Forest**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.57239	-75.94892	Old Hobbit and Elf Trails	17	Lots of needle loss on bottom layers
2	43.57198	-75.94806	Old Hobbit and Elf Trails	22	
3	43.59586	-75.96239	Trail 6	15	
4	43.59459	-75.96341	Near Trails 1 & 2 Junction	20	
5	43.58818	-75.96255	Trail 7	20	
6	43.58815	-75.96411	Trail 1	20	

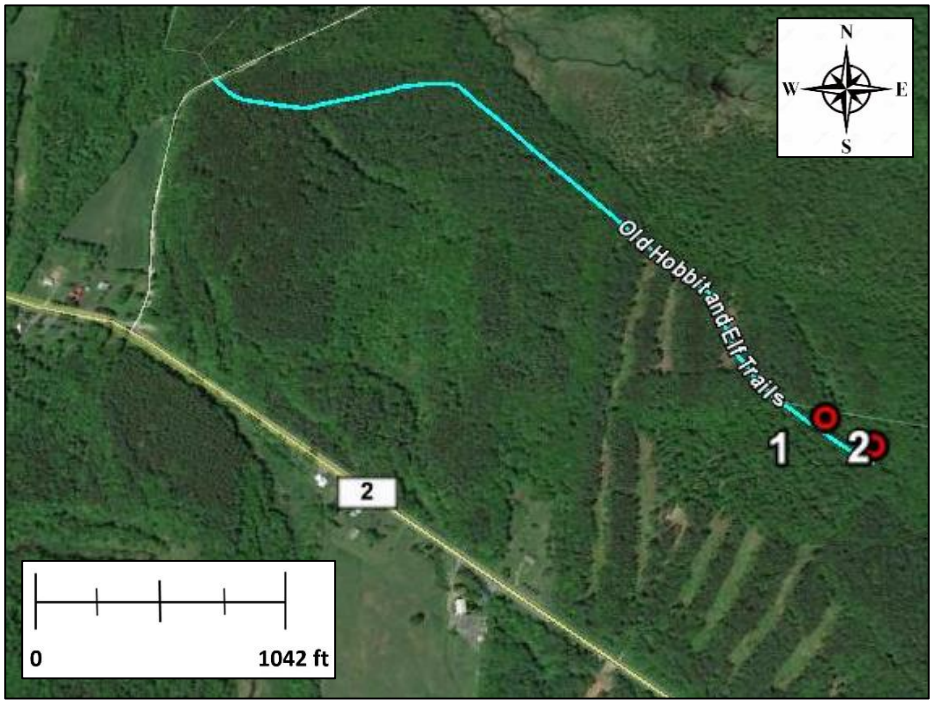

Figure 19. Survey path at Chateaugay State Forest for survey points 1 and 2.

Parking access for points 1 and 2: Along Jackson Road in Richland, NY.

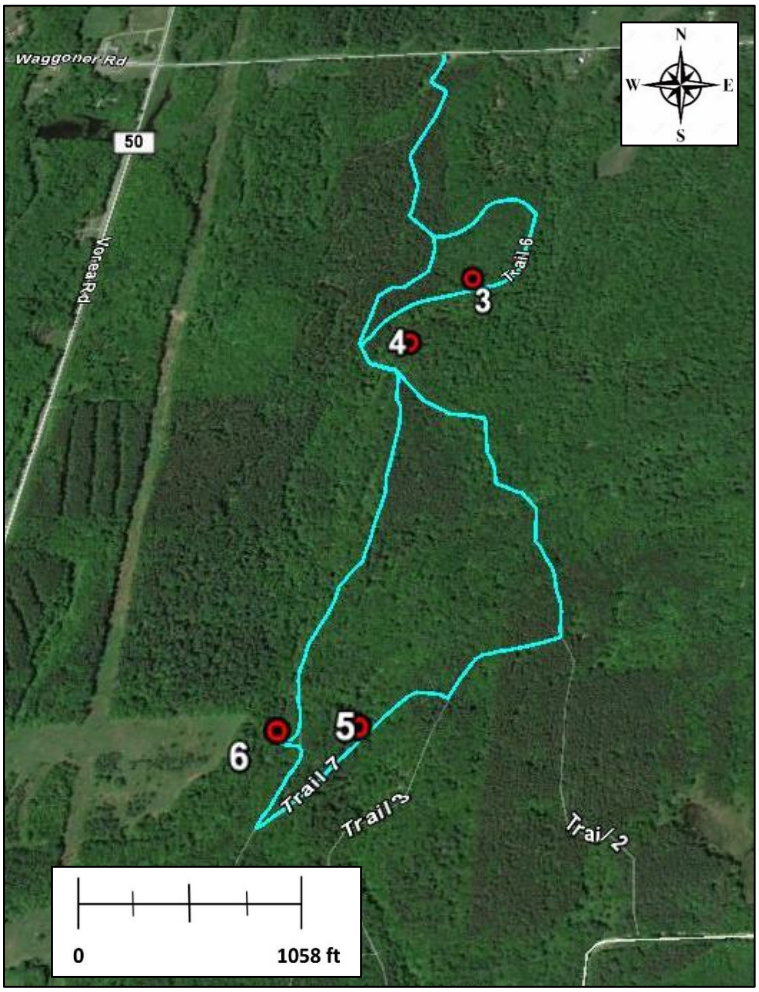

Figure 20. Survey path at Chateaugay State Forest for survey points 3 – 6.

Parking access for points 3 – 6: Along Waggoner Road in Richland, NY.

Trenton Greenbelt: August 19th

Table 5. Hemlock woolly adelgid survey results from Trenton Greenbelt.

***Highly Probable Area:* Trenton Greenbelt**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1*	43.24519	-75.21046	Yellow Trail	20	Not a lot of growth at bottoms of trees, scarce needles
2*	43.2431	-75.21072	Yellow Trail	20	
3*	43.2435	-75.20242	Blue Trail	20	
4*	43.2439	-75.20592	Blue Trail	20	

Key: * = Survey point added in 2016 survey

NOTE: All survey points at Trenton Greenbelt were added in 2016 because the 2015 survey did not take place at the Trenton Greenbelt Park.

Figure 21. Survey path at Trenton Greenbelt.

Parking access for points 1 – 4: Lot off of Wood Road in Barneveld, NY.

Penn Mountain State Forest: August 19th

Table 6. Hemlock woolly adelgid survey results from Penn Mountain State Forest.

***Highly Probable Area:* Penn Mountain State Forest**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.35899	-75.2509	Duck Pond Trail	20	Very large stand

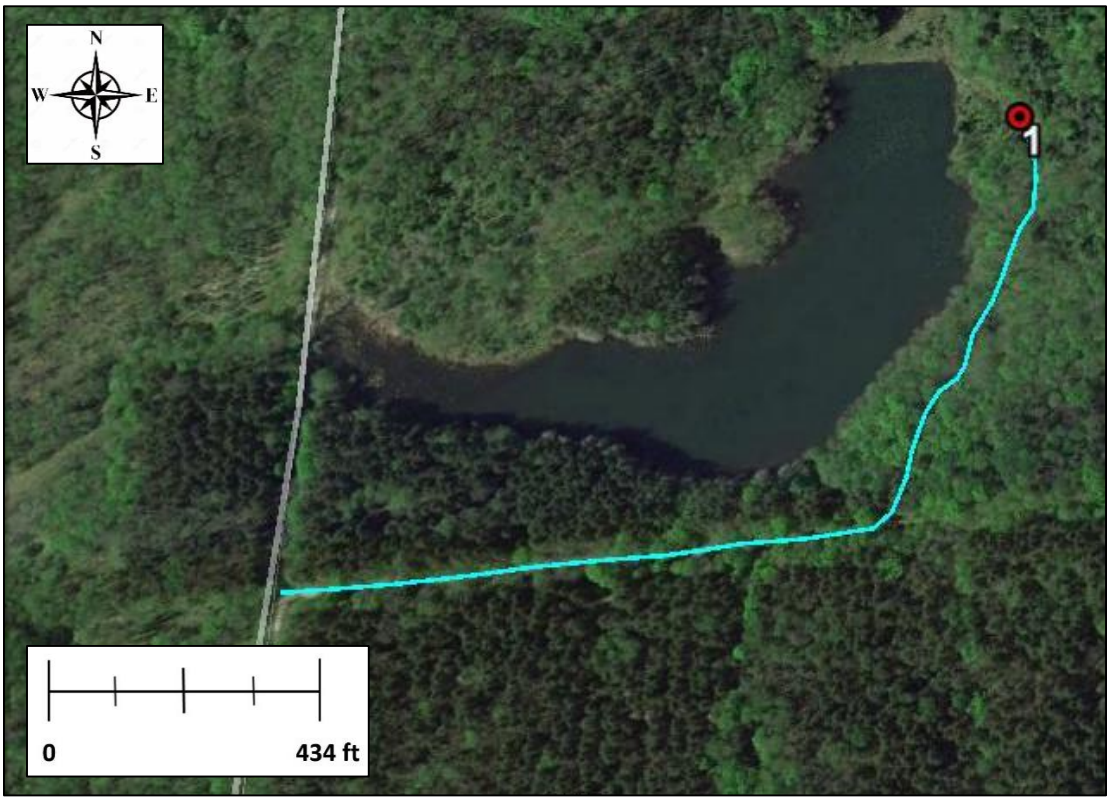

Figure 22. Survey path at Penn Mountain State Forest.

Parking access for point 1: Small parking area off of Penn Mountain Road at point 1 in Remsen, NY.

Clark Hill State Forest: August 23rd

Table 7. Hemlock woolly adelgid survey results from Clark Hill State Forest.

***Highly Probable Area:* Clark Hill State Forest**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.35786	-75.310996	Along Boody Hill Rd	20	
2	43.35902	-75.309767	Along Boody Hill Rd	20	
3	43.35956	-75.310377	Along Boody Hill Rd	20	
4	43.36398	-75.313283	Along Boody Hill Rd	20	

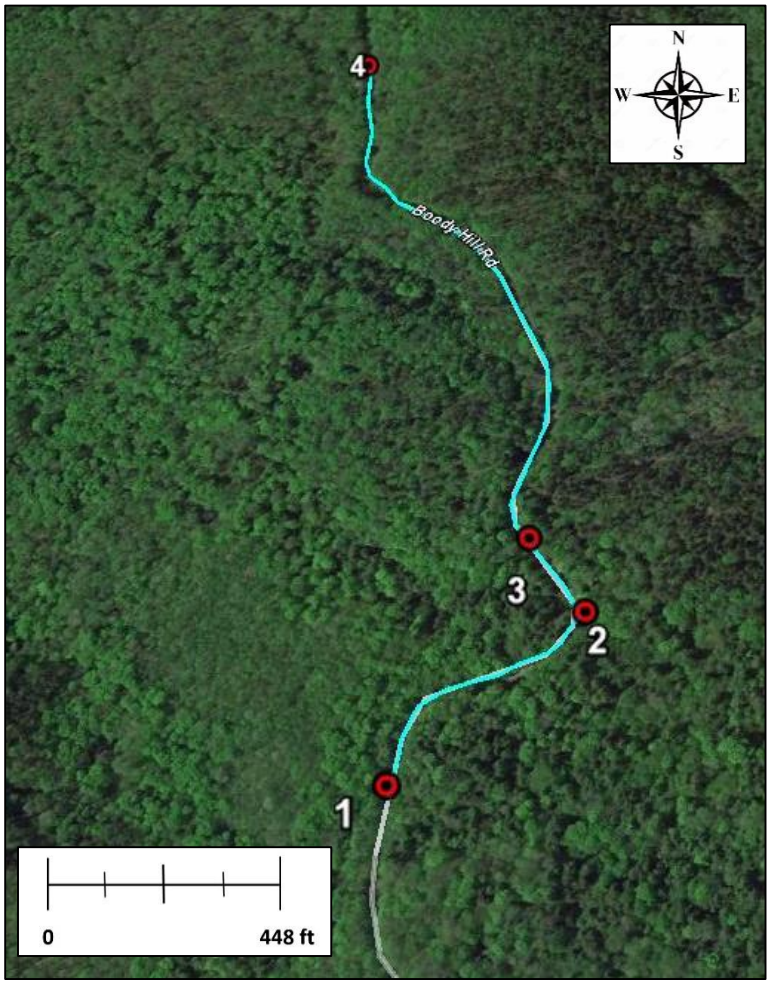

Figure 23. Survey path at Clark Hill State Forest.

Parking access for points 1 – 4: Along Boody Hill Road in Remsen, NY.

Buck Hill State Forest: August 23rd

Table 8. Hemlock woolly adelgid survey results from Buck Hill State Forest.

***Highly Probable Area:* Buck Hill State Forest**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.38232	-75.36503	Along Hertz Rd	20	
2	43.38032	-75.36469	Along Hertz Rd	20	

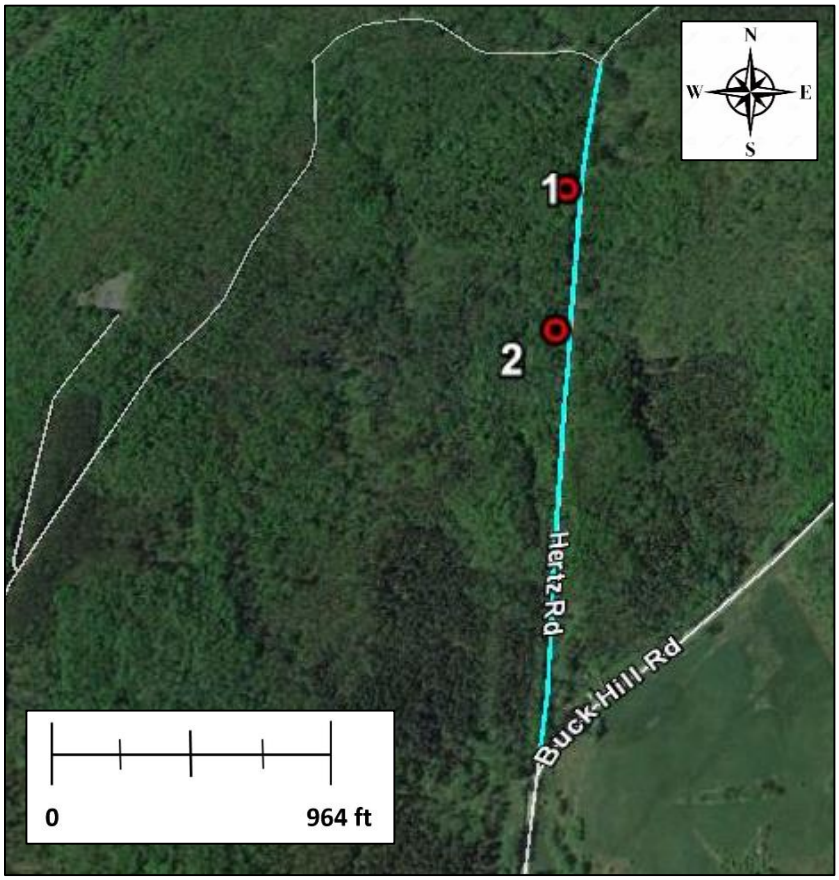

Figure 24. Survey path at Buck Hill State Forest.

Parking access for points 1 and 2: Along Hertz Road in Westernville, NY.

Forest Park: August 29th

Table 9. Hemlock woolly adelgid survey results from Forest Park.

***Highly Probable Area:* Forest Park**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.331886	-75.737165	Along Woodland Ave	20	Seems to be damage on lower branches, spotty, not all bare
2	43.330463	-75.736119	Along Woodland Ave	20	Also seems to be damage on lower branches
3	43.329396	-75.733154	Along Woodland Ave	20	
4	43.326102	-75.730223	Along Costello Ave	20	Lots of bare lower branches
5	43.328366	-75.736368	Along Costello Ave	20	
6*	43.3273	-75.73111	Along Costello Ave	20	Sparse needles on lower branches, a lot of discoloration

Key: * = Survey point added in 2016 survey

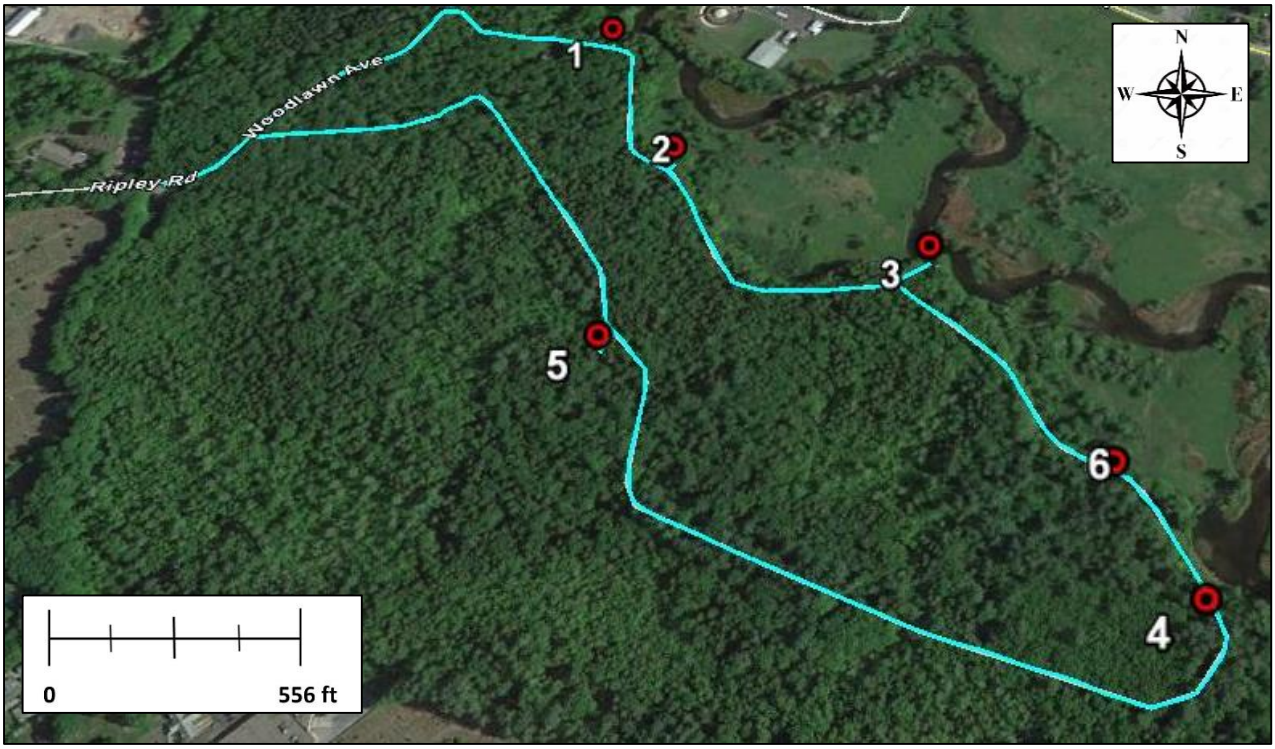

Figure 25. Survey path at Forest Park.

Parking access for points 1 – 6: Lot off of Ripley Road in Camden, NY.

Mad River State Forest: August 29th

Table 10. Hemlock woolly adelgid survey results from Mad River State Forest.

***Highly Probable Area:* Mad River State Forest**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.403358	-75.764833	Along McSpirit Rd	23	
2	43.408838	-75.759221	Along McSpirit Rd	20	Some with lower branches free of needles
3	43.409421	-75.748769	Along Rehm Rd	20	
4	43.383481	-75.740304	Off River Rd Near Powerlines	20	

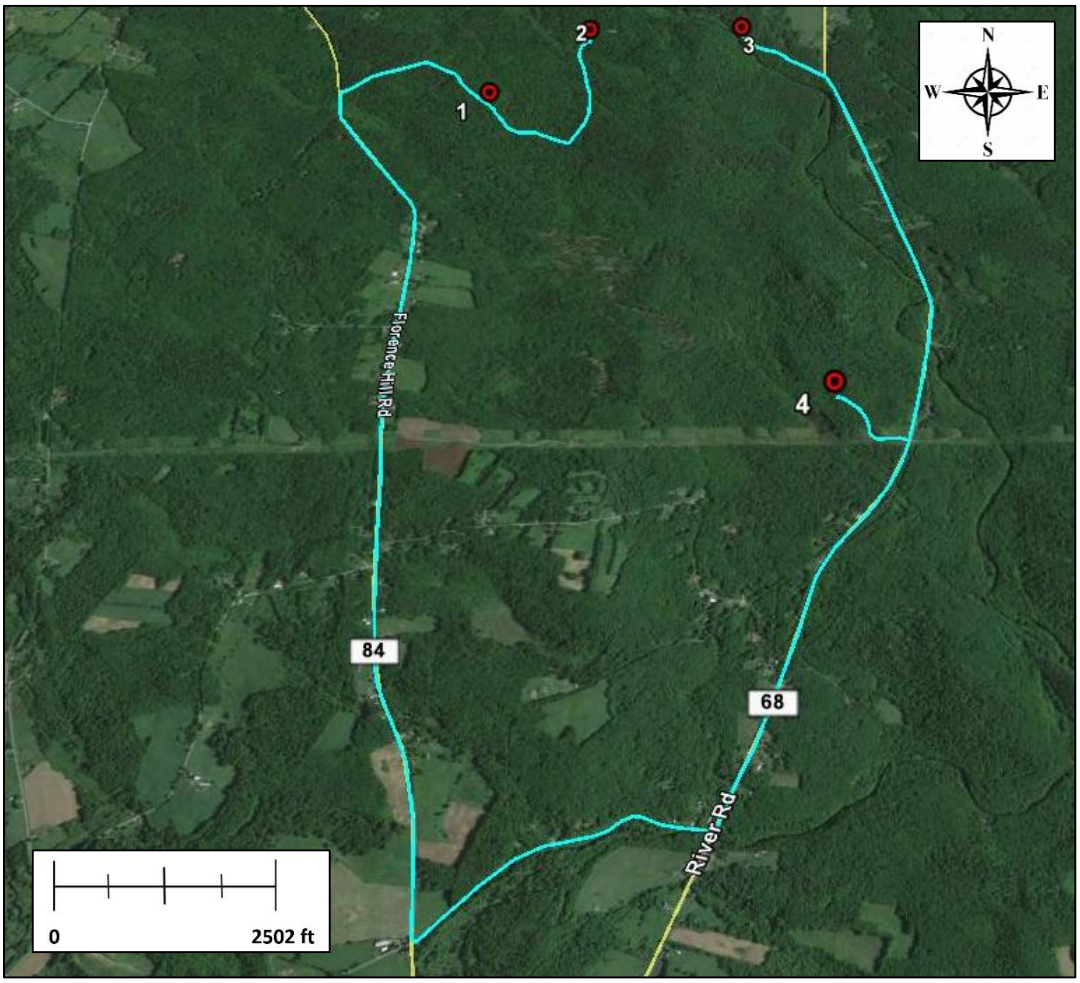

Figure 26. Survey path at Mad River State Forest State Forest.

Parking access for points 1 and 2: Along McSpirit Road in Camden, NY.

Parking access for point 3: Along Rehm Road in Camden, NY.

Parking access for point 4: Lot off of River Road and down powerline access road in Camden, NY.

Happy Valley Wildlife Management Area: August 29th

Table 11. Hemlock woolly adelgid survey results from Happy Valley Wildlife Management Area.

***Highly Probable Area:* Happy Valley Wildlife Management Area**					
Survey Site	***Latitude***	***Longitude***	***Description***	***Number of Trees Surveyed***	***Observations***
1	43.433923	-75.965109	Along Britton Rd	20	
2	43.436986	-75.95108	Along Britton Rd	20	Many bare branches at bottom
3	43.411059	-76.001906	Along Happy Valley Rd	20	Many bare branches at bottom

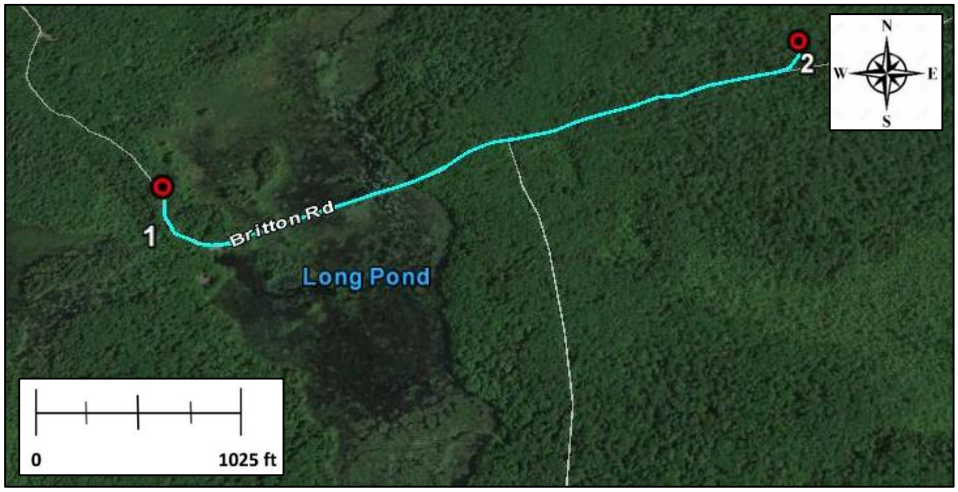

Figure 27. Survey path at Happy Valley Wildlife Management Area to reach survey points 1 and 2.

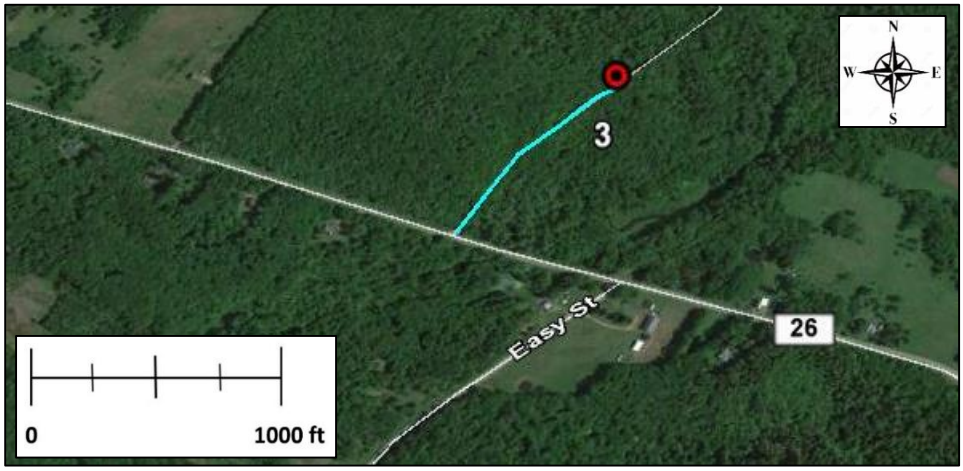

Figure 28. Survey path at Happy Valley Wildlife Management Area to reach survey point 3.

Parking access for points 1 and 2: Along Britton Road in Williamstown, NY.

Parking access for point 3: Along Happy Valley Road in Williamstown, NY.