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# The Study of Hemlock Woolly Adelgid in Epping, New Hampshire

Maela B

## **Introduction:**

The hemlock woolly adelgid, or HWA, is an invasive insect that preys on eastern hemlock trees. The HWA was most likely brought to the United States through transportation from “Japan and possibly China.” (New York Invasive Species Information) This invasive species sticks their mouth into the twig of the eastern hemlock tree and sucks and blocks the nutrients from the tree. This causes the tree to slowly die over a 3 to 5 year span. Eastern hemlock trees provide shade- this is important because it “keeps snow from melting until later in the spring, keeping water temperatures lower later in the season and slowing the recharge of streams for cleaner, cooler water.”(NYSHI) Hemlocks also provide shelter for many species of animals including black bears, snowshoe hares, porcupines, bobcats, and many others. Since the HWA is not native to eastern American land, there are no natural predators to keep the population to a minimum; causing the population of HWA to increase rapidly. The HWA also reproduces asexually, another reason why the population is increasing faster. The data collected was motivated by the question, “Where is hemlock woolly adelgid now, and where might it spread next? Is climate change affecting how hemlock woolly adelgid spreads?” (Gulf of Maine Research Institute) We analyzed the trend of average minimum low winter temperatures in Rockingham County, New Hampshire and collected data on the hemlock woolly adelgid population in Epping, NH. Cold temperatures affect HWA. An entomologist at Cornell University in Ithaca, New York Mark Whitmore says, “I expect them now, with the mild winter we had and perhaps another mild winter, the populations to begin spreading much more rapidly.” (WOSU News)

## Methods:

This study was conducted April 20, 21, 22 and May 3, 2022 in the woods of Epping Middle High School in Epping, New Hampshire. The study was in place to find hemlock woolly adelgid. During this study Mrs. Lapointe's science classes surveyed 30 eastern hemlock trees in two different sites shown in Figure 1.



**Figure 1.**

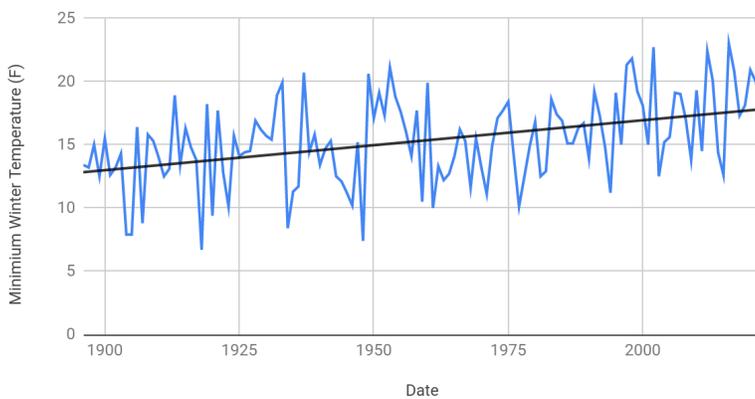
This image shows the location of the two sites that Mrs. Lapointe's science classes surveyed. Site 1 is by a pond and most trees are hemlocks. Site 2 was a very dense forest on the edge of a challenge course. On both sites students were allowed to either stay on the edge of the trail or go into the woods.

The protocol for this study is found on the Gulf of Maine Research Institute website. (Ecosystem Investigation Network) The protocol is to find an eastern hemlock tree and then confirm that it is an eastern hemlock with four photos, a peer, and Mrs. Lapointe. Then when verified, the hemlock tree was marked with a blue ribbon symbolizing it had been surveyed. Next, ten branches of the hemlock tree were searched that were at least one meter long. If the ten branches were out of reach or couldn't be

surveyed, it was recorded. If HWA was found, the eastern hemlock tree was marked with a white ribbon and three additional photos of the HWA were taken. After we collected the data it was put into the Gulf of Maine Research Institute Ecosystem Investigation Network website. This allowed Epping, NH to be a part of a larger data set and help answer their research question “Where is hemlock woolly adelgid now?”(GMRI)

**Results:**

The Change of Winter Temperature in Rockingham County New Hampshire from 1896-2022



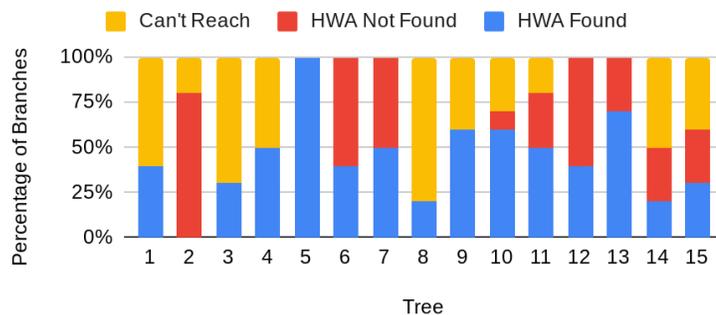
**Figure 2.**

This graph shows that the minimum winter temperature in Rockingham County, New Hampshire from 1896 - 2022 has increased. This data is available to the public from the National Oceanic and Atmospheric Administration’s National Center for

Environmental Information. (NOAA)

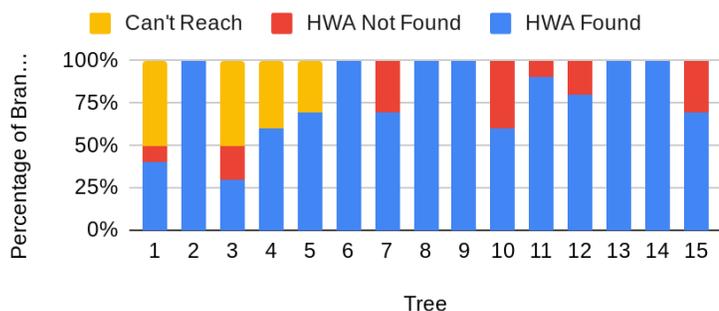
Branches of Trees Surveyed April 20, 21, 22 and May 3 in Epping NH, Site 1

Figure 3.



## Branches of Trees Surveyed April 20, 21, 22 and May 3 in Epping NH, Site 2

Figure 4.



### Figure 3 and 4.

These graphs show the branches that were surveyed in both Site 1 and 2 (location shown in Figure 1) that were infested, were not infested and/or couldn't be reached. Looking at these two graphs Site 2 has the most infested branches/trees. Site 1 had 66 infested branches counted and Site 2 had 117 infested branches counted.

### Conclusion:

There is hemlock woolly adelgid in Epping, New Hampshire. The data collected has shown there is a severe infestation. It is unknown when HWA first appeared in Epping, New Hampshire but it was first documented as a data set on the GMRI Investigation Network in June 2019. HWA was also recorded in 2000 by University of New Hampshire NH Bugs program, "Hemlock Woolly Adelgid (HWA) was first discovered in New Hampshire in Portsmouth in 2000" (NH Bugs) which is also in Rockingham County. Figure 3 and 4 show that there is more HWA found than not found on the hemlock trees. In addition, 96% of the hemlock trees that were sampled were infested with this invasive species. The rising winter temperatures may be affecting the spread of the hemlock woolly

adelgid. The rising temperatures are caused by global warming. Global warming is the “long-term heating of Earth's climate system observed since the pre-industrial period (between 1850 and 1900) due to human activities”(NASA). An entomologist at Cornell University in Ithaca, New York, Mark Whitmore says, “hemlock woolly adelgids are sensitive to cold.” (WOSA) With the rising temperatures, the HWA will start to become more present on hemlock trees, the cold winters won't be as cold allowing the HWA population to grow more rapidly.

Through this study for the hemlock woolly adelgid there could have been some possible errors that occurred. For example, many eastern hemlock trees that were sampled for this study had branches that could not be reached. Therefore, data could not be collected for the unreachable branches. Another complicating factor is that it is very difficult to compare years of change in the HWA. We could not sample the trees that have been sampled in the past. We can not compare the change of population that would help to support the claim, HWA is sensitive to the cold.

The next step scientists should take to make the study more accurate is to modify the protocol. This could be that the scientists at the Gulf Of Maine Research Institute change the protocol so that the person collecting data would have to double check all branches to make sure that there is HWA. Another thing that could be altered would be that instead of ten branches being sampled it would have to be more. This would allow more data to be collected on the spread of hemlock woolly adelgid. Moving forward in order to increase the knowledge on how the population of HWA is growing scientists would have to compare data from past years to the current year. This helps find out how fast the HWA population is rising and spreading.

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