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Aurie A

Epping Middle-High School

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The Infestation of Hemlock Woolly Adelgid in Epping, New Hampshire 2022

Aurie A

Introduction

The hemlock woolly adelgid is an invasive species that was brought over from East Asia to the USA that is very destructive. It is an insect and it is identified as white fuzzy dots that cling onto the underside of eastern hemlock tree branches. These are the egg sacks; the insects are microscopic. When they do this, the invasive species sucks all the sap and nutrients out of the tree needles that it needs to live. When the sap is gone from the needles, they fall off the tree, and that's when the tree starts to die. The hemlock tree helps prevent erosion in riverbanks and when the tree dies, the riverbanks would start to collapse because it doesn't have the support it needs to stay up. The insects are causing a negative chain reaction in the environment. It is invasive because the hemlock woolly adelgid has no natural predator here in the United States like it does in Asia. The *Laricobis osakensis* beetle ([Darr and Coyle, 2019](#)) has been brought over from Asia to help control the invasive species and it's slowly being released into the wild to help save the hemlock trees. The insect is an asexual reproductive species which means it only takes one bug to reproduce and lay a whole bunch of eggs. The more eggs that are laid, the more bugs that hatch and start killing the hemlock trees. Our research questions are "Where is hemlock woolly adelgid now, and where might it spread next? Is climate change affecting how hemlock woolly adelgid spreads?" The two parts of the research process we are trying to answer have to do with the minimum temperature in Rockingham County, New Hampshire, and to look for the hemlock woolly adelgid in groups of trees in the two test sites we (Mrs. Lapointe's 8th grade students) visited. This investigation adds research to the previous data collected by the Gulf of Maine Research Institutes Ecosystem Investigation Network. It will address the gaps in our existing scientific knowledge on the hemlock woolly adelgid, what conditions it can survive in, and where it thrives best. This way we will have a better understanding of the invasive species itself and what we can do as a nation to control it and save our eastern hemlock trees.

Methods

On April 20th, 21st, 22nd, and May 3rd, Mrs. Lapointe's 8th grade classes went outside behind Epping Middle High School near Hoar Pond as Test Site 1 and the Low Ropes Course as Test Site 2 to search for the invasive species called hemlock woolly adelgid. Out of all four block classes, we sampled 30 trees to see how



bad the infestation was at our school.

Figure 1

The figure to the left shows the hemlock woolly adelgid attached to the underside of the needles and it shows the two stripes on the tree needles.

The protocol followed was from [The Gulf of Maine Research Institute](#). It called for four photos of the tree to prove it was an eastern hemlock tree.

One picture of the whole tree, one picture of a close up on the tree trunk, one picture of a branch, and one picture of the needles that were attached to the tree branch. The needles needed to have the two white racing stripes and the petiole that was attached to the tree to prove it was an eastern hemlock tree. Next, once verified with a peer that the tree was in fact an eastern hemlock tree, we were to investigate ten branches that were one meter long, looking for the hemlock woolly adelgid. If the students were not able to survey ten branches, then it was noted. If the insect was found on the tree branch, then the protocol said to take three photos of the same infestation to prove that it's clear that it was found on the same branch. Once we completed gathering the data, we uploaded it to The Gulf of Maine Research Institute. Some things that could have impacted our results of collected data would be students making changes to the test sites, or weather conditions. Being in New Hampshire, heavy rainfall and strong winds could have damaged the trees we would be researching.



Figure 2

This shows the little details on the pine needles that needed to be included in the picture students had to send to the research website on GMRI.

In order to analyze the temperatures that affected the HWA, we referred to NOAA for the minimum temperature data on their National Center for Environmental Information for Rockingham County. ([NOAA, 2021](#))

Results

Minimum Winter Temperature from 1896 - 2022 (F) in Rockingham County NH

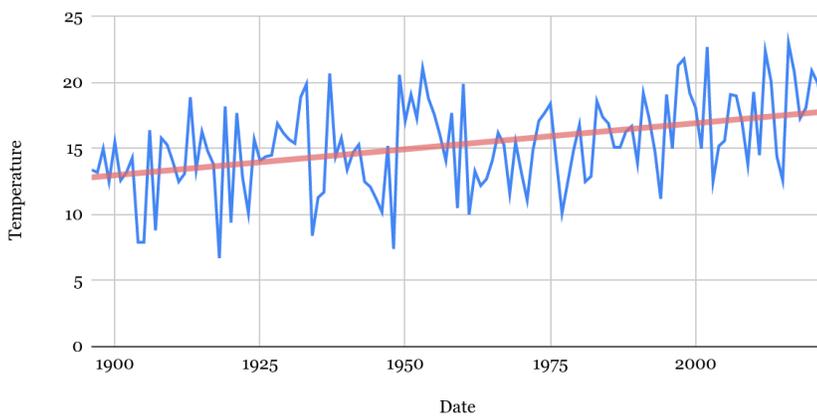


Figure 3

This shows that as the years went on in Rockingham County, it's gotten warmer during the winter months and the trend line is going up. ([NOAA, 2021](#))

HWA Found on Site 1

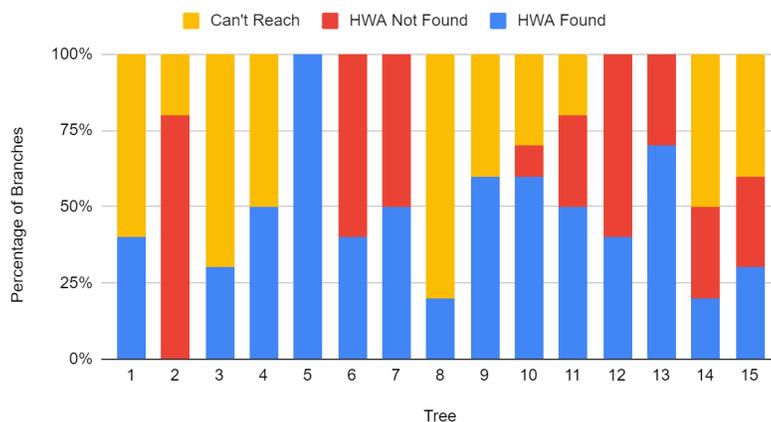


Figure 4

This shows the amount of hemlock woolly adelgid found at Site 1. There are 6 out of 15 trees at Site 1 that were 100% of the sampled branches were infested with hemlock woolly adelgid. It also shows that there were many trees where some of the sampled branches did not have any HWA found on them.

HWA Found on Site 2

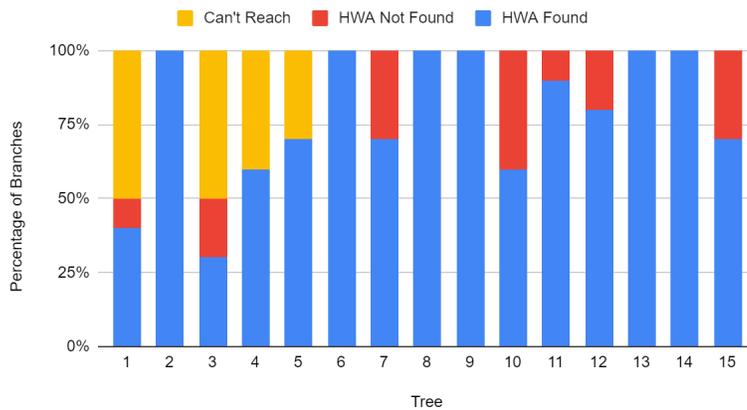


Figure 5

This shows the amount of hemlock woolly adelgid found at Site 2. At Site 2, 8 out of 15 trees sampled were 100% infested. It also shows that there weren't as many tree branches that didn't have HWA found on them which means the infestation in Site 2 was significantly worse.

Conclusion

The hemlock woolly adelgid was found in Epping, New Hampshire. There is a severe infestation. We know this because the students of Mrs. Lapointe's 8th grade class searched two different sites in the woods behind Epping Middle High School and both came back with positive results. There were 29 out of the 30 trees infested. Specifically, at Site 1, 6 out of 15 trees were 100% infested, and at Site 2, 8 out of 15 trees were 100% infested. Found in past data, the hemlock woolly adelgid has been reported to die off in winter in temperatures of -4°F because the bugs need warm weather to thrive. They lay their eggs between March and April which gives them all of the warm weather months to thrive, grow and infest more trees. ([Kelly, 2022](#)). The problem is

that the winter temperatures have been increasing each year because of global warming, meaning not as many of the hemlock woolly adelgid are dying off in the winter/colder months.

Some errors in the [protocol](#) that could have been made were students not putting enough effort into looking for the insects. A solution to this could be to have a peer verify that there is in fact no HWA found on the tree. This way the data would come back with fewer possible errors.

A recommendation for future scientists would be to sample and survey more trees. This way there will be more data to work with and we will be able to understand better how severe the infestation of this invasive species really is. Another thing future scientists could do is conduct their investigations in multiple different seasons so we can compare and contrast the data we collect based on the different temperatures.

GMRI's research question is "Where is hemlock woolly adelgid now, and where might it spread next? Is climate change affecting how hemlock woolly adelgid spreads?" The data collected is evidence of the hemlock woolly adelgid being located in Epping, New Hampshire, and the invasive species seems to be thriving off of the eastern hemlock trees located at the low ropes course behind Epping Middle High School where we found the most out of the two test sites. Climate change is likely a part of the spread based on rising temperatures in the area and the previous studies that cold temperatures prevent spread.

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