


**HARVARD FOREST**  
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HARVARD UNIVERSITY



**Harvard LTER Schoolyard Program**

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**Teacher Developed Lessons and Documents that integrate  
Harvard Forest Schoolyard Ecology Themes into curriculum.**

- Lesson Title: **Student Work Sample-Hemlock Report**
- Teacher/Authors: **Katharine Hinkle and Students**
- School: **Innovation Academy Charter School**
- Level: **9<sup>th</sup> Grade**
- Date: **May 2021**

### **Background information (Student 'A')**

HWA, or the Hemlock Woolly Adelgid is an invasive species that attacks Eastern Hemlocks. HWA are very small, averaging around 1.5 mm making them often hard to see, but they can be easily identified by the white woolly masses forming on the underside of branches at the base of the needles. The HWA is spreading through the United States from planted trees to native trees. HWA dispersal is usually by wind, birds, deer and humans. They are impacting New England by spreading to each Eastern Hemlock tree, infecting it and killing the trees.

### **Connection Circle (Student 'K')**

In our [connection circle](#), our 7 factors are Amount of Hemlock Trees, Amount of HWA, Amount of Foresters, Amount of Erosion, Pesticide Usage, Amount of Little Larry, and Temperature Outside. We have lots of connections on our connection circle but here is one example for each of the factors that we have listed. The easiest one to point out is the more HWA, the less Hemlock trees there will be. Another connection we found is the more foresters cutting down Hemlock Trees, the less Hemlock trees there will be. We also found that with more erosion, the less trees there will be. Next, we found that the more pesticide or insecticide usage, the less HWA there is. The same is for little larry or other biological agents, the more of them eating the HWA, the less HWA there is. As we know, the HWA are active in the winter time unlike most other animals, so the colder the temperature, the more HWA there will be. One feedback loop we found is the more HWA, the more pesticides/insecticides need to be used, and the more pesticides/insecticides are in use, there will be less HWA, leading to more Hemlock Trees, and with more healthy Hemlock trees, the less HWA there will be.

### **Dilemma (Student 'S')**

Mr. Orpen came to Ms. Hinkle one day after he noticed something suspicious on his tree, later he found out that it was the work of the Hemlock Woolly Adelgid, otherwise known as the HWA. Upon discovering this, he noticed that it was affecting the 7-10 Eastern Hemlock trees that he has on his property. These trees are located on the edge of his property, towards the

woods, surrounded by some Pine, Oak, and Ash trees. These trees have an unknown age to Mr. Orpen, but are very tall, roughly 20-30 feet tall, and have a very wide average trunk diameter of 12-18 inches, depending on the tree. There have been no recent changes in these trees, but a few are in very rough shape.

Mr. Orpen sent us some pictures of a few of the trees that he has on different parts of his property and we examined the images and made some crown health ratings based on how many needles the trees have, if there are a lot, or a few bare branches, and if the trees look completely normal, all green, nothing appearing to be wrong. For the three images that we examined, our group said that the first tree appeared to be a 1, meaning that the tree looked completely healthy, it was all green, and there were no bare branches. The second tree, we said that it looked like a 1 to a 2 because there were some bare branches, but it looked like a healthy tree in general, aside from those branches. Finally, we examined the third tree, which we decided looked to be a 2 but on the cusp to being a 3, we said this because the tree looked like it was in pretty rough shape, but not rough enough to the point that it had lost all of its green because what defines a 3, is that there is no green, and all of the branches were bare, but this was not the case for this tree, but easily could be in a year if not treated correctly.

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\*These are the trees from The Orpen's property that Mr. Orpen sent us, the order of these trees is tree 1, tree 2, and tree 3.



### **Recommendation (Student 'J')**

After a lot of consideration and thought, our group has decided that dinotefuran is the best option for managing the Hemlock Woolly Adelgid. This group decision was based on many factors and how the surrounding environment will be affected. Some of the reasons we chose this product instead of others is because unlike other chemical solutions, this one holds little risk of harming other species or getting into water sources. This product which is commonly known as Safari, breaks down in sunlight and in water. Meaning that if this product was ever to go further than it should, like into a water source, the chemicals would break down, leaving no harm to the species that inhabited the water. Safari is used as a basal bark spray meaning that the product is sprayed at the base of the tree, and as the tree absorbs nutrients from the soil it will also ingest the chemicals. These chemicals will go up into the tree and when the Hemlock Woolly Adelgid goes to feed they will be ingesting the chemicals which will end up killing them.

There may be concerns about other species and that they could ingest this product but luckily hemlock trees are not pollinated by any pollinators but by wind, meaning that this product does not impose any concerns for them. The hemlock trees on Mr. Orpen's property are also next to ash trees which happen to also be pollinated by wind, meaning that if his ash trees happen to also absorb the product they will not cause any issues. The only issue that this product may have is if the woodpeckers in the neighborhood start to peck at these trees. If the woodpeckers were to peck at the trees with chemicals they could ingest this product which would be harmful to them. A way to prevent this issue from occurring is to make sure that there are no bird feeders hung around this area to prevent woodpeckers or other birds from accidentally ingesting the chemicals.

Although this product holds little concerns to the environment there are specific rules that need to be followed. Safari is only to be used during fall or springs seasons and is to be used as

a basal bark spray. Safari can be found on Walmart where it costs \$122.49 for a 12 ounce bottle or on amazon where it costs \$424.40 for 3 pounds. Although this may seem like a lot of money, this product is highly effective and only is to be applied once a year, meaning that the amount bought will last for a long time and you wouldn't have to buy it again for another year or two.

Recommendations Cites:

“Safari 20SG Systemic Insecticide with Dinotefuran.” Amazon. Accessed November 15, 2020.

<https://www.amazon.com/Safari-20SG-Systemic-Insecticide-Dinotefuran/dp/B009AFIG52>

“Safari 20SG Systemic Insecticide (Dinotefuran) - 12 oz.” Walmart. Accessed November 15, 2020.

<https://www.walmart.com/ip/Safari-20SG-Systemic-Insecticide-Dinotefuran-12-oz/430113210>

“Frequently Asked Questions about Chemical Control of Hemlock Woolly Adelgid (HWA).” New York state department of environmental conservation. Accessed November 15, 2020.

[https://www.dec.ny.gov/docs/lands\\_forests\\_pdf/hwamgmtfaq.pdf](https://www.dec.ny.gov/docs/lands_forests_pdf/hwamgmtfaq.pdf)

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