

Harvard Forest Schoolyard Ecology

The Woolly Bully

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Integration into Curriculum

- Integrated into existing units in my conservation/ecology class
 - Not stand alone project
 - Revisited throughout course
 - Ecosystems, feeding interactions, biological controls, invasive species
 - New major component of Native Tree Study
 - Students construct electronic field guides



Eastern Hemlock

Tsuga canadensis



- **Leaves:**

- .6 - .9 inches long
- flat
- under is blue/green
- top is shiny green/yellow
- slightly toothed near apex



- **Bark:**

- brown
- deep narrow openings
- scaly

- **Fruit:**

- egg shape
- .6 – 1 inch long
- .4 - .6 inch wide
- red/brown
- ovate scales

- **Bud:**

- egg shape
- small, .05 - .1 inch long
- blunt
- chestnut brown

- **Height:**

- 100 feet

- **Commercial Value:**

- railway ties, pulp, timber, general construction, boxes and crates



Sample from a student field guide

Before going outside, consider...

- Medical complications-
 - Communication
- Bug Spray list-Mahar
 - Supervision
 - Expectations!
 - School Rules

Research protocol-in classroom

- Students never have heard of Woolly Adelgid
- Provide background knowledge
 - Overview of woolly adelgid
 - Introduction into US
 - Distribution
 - Spread
 - Important to study now!
 - Hemlock identification
 - Pine, spruce, hemlock




Identification of plots

- Dictated with lower level
 - Location vs. risk/trust
- Micro-climates- Advanced level
- Aquatic
- Shade
- Direct sun
- Open area
- Other species
- Age of hemlock



Research Protocol

- Supplies
 - Identification markers
 - Data sheet
 - Writing utensils
- Removal of tags- map the area
 - Compass
 - Multiple measuring devices



Harvard Forest Schoonyard Ecology
Woolly Bully: Hemlock Trees and the Invasive Pest, the Woolly Adelgid

Student Data Sheet

Name(s): _____			
School: _____			
Date: ____/____/____			
Site Name/location: _____			
Tree ID Number: _____			
Tree Crown health (0-3): _____			
0 - Healthy-all green		4 - dead - killed by HWA	
1 - Some bare branches		5 - cut down due to HWA	
2 - Unhealthy- half or more bare branches		6 - cut down due to reasons other than HWA	
3 - Dead- no green needles			

ID Tree/Branch number/letter	White wool present(1) Absent(0)	Number of Egg Sacs Per 10cm segment	New Growth at Branch Tip (cm)

Summary data for Tree Number:	White wool Present(1) Absent (0)	Average Number of Egg Sacs	Average New Growth (cm)

Field notes/comments: Please write field observations re: field conditions such as climate, wildlife, presence of other insects, and other plants on the reverse of this form. Note what other types of trees are nearby and may replace hemlock if it dies.

Research-Part 1

- Tag branches
- Measurements



Research-Part 2

- Hypothesize
 - microclimates
- Locate
- investigate



Identification of Woolly Adelgid Eggs



Woolly Adelgid Eggs-Identification Problems?



Woolly Adelgid Eggs-Identification Problems?



Woolly Adelgid Year 2

- Continue Research
- Expand measurement areas
- Bring in expert?

