

“Woolly Bully” - Hemlock Trees and the Invasive Pest, the Woolly Adelgid



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Tips for Successful Field Experiences

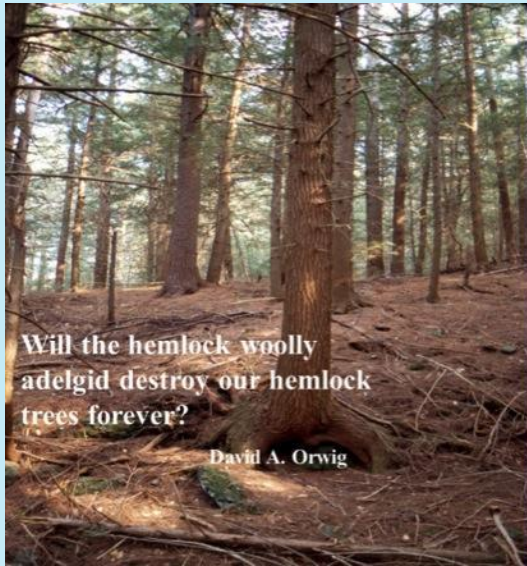
- **Send a letter home explaining your study and include tentative dates for field work**
- **Prepare your field site- check for any hazards.**
- **Make sure all students visit the restroom before leaving**
- **Practice data taking and other skills inside first**
- **Check all supplies before going out.**
- **All students should be responsible for completing a data sheet.**
- **Remind students that going outside for science is a privilege. Review the basic rules each time.**
- **Have your active students carry the heavy equipment!**

Safety First +

- ✓ All students should have appropriate footwear and clothing.
- ✓ Check with students or the school nurse for possible allergies.
- ✓ If it is sunny, hats and sunscreen should be worn.
- ✓ Thoroughly check your field site for hazards such as bees' nests and hanging branches.
- ✓ A little rain is ok, but stay out of the woods during storms and on very windy days.
- ✓ Take a radio or cell phone with you.
- ✓ Review safety rules often.



Get Started in the Classroom-



Review of HWA
 Overview of studies
 At HF:
 past
 current
 future?

Show Some Pictures-
 Pictures of students participating in the study are helpful.

Show Dave's PowerPoint.



Pest Alert

Hemlock Woolly Adelgid

Native to Asia, the hemlock woolly adelgid (*Adelges abietis*) is a small, aphid-like insect that threatens the health and sustainability of eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*Tsuga carolinensis*) in the Eastern United States. Hemlock woolly adelgid was first reported in the Eastern United States in 1951 near Richmond, Virginia. By 2005, it was established in portions of 16 States from Maine to Georgia, where infestations covered about half of the range of hemlock. Areas of extensive tree mortality and decline are found throughout the infested region, but the impact has been most severe in some areas of Virginia, New Jersey, Pennsylvania, and Connecticut.

Hemlock decline and mortality typically occur within 4 to 10 years of infestation in the insect's northern range, but can occur in as little as 3 to 6 years in its southern range. Other hemlock stressors, including drought, poor site conditions, and insect and disease pests such as elongate hemlock scale (*Piorinia extensa*), hemlock looper (*Lambdina foveolata foveolata*), spruce spider mite (*Oligonychus ununguis*), hemlock borer (*Melanophila fulvipes*), root rot disease (*Armillaria mellea*), and woodborer (*Melospiza parvoviti*), accelerate the rate and extent of hemlock mortality.

Hosts
 The hemlock woolly adelgid develops and reproduces

United States
 Department of
 Agriculture
 Forest Service
 Northeastern Area
 State and Private Forestry
 NA-PP-09-05
 August 2005



Figure 1.—Hemlock woolly adelgid ovules.

observed from late fall to early summer on the underside of the outermost branch tips of hemlock trees (figure 1).

Life History
 The hemlock woolly adelgid is parthenogenetic (all individuals are female with asexual reproduction) and has six stages of development: the egg, four nymphal instars, and the adult. The adelgid completes two generations a year on hemlock. The winter generation, the adults, develops from early summer to midwinter of the following year (June–March). The spring generation, the progeny, develops from winter to early summer (March–June). The

Do some research - there's a lot on line too.



★ Practice measuring
new growth in the
classroom first- this is key!

Preview the data sheet in the classroom. Have the students fill in the top portion. Remind them how important it is to include the date!



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

Student Data Sheet

Name(s):
School:
Date:
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 for other reasons
3 -Dead- no green needles	

Where is
the crown
of the
tree?

Time of measure:			
	Autumn	Spring	Spring
ID Tree/Branch Number/letter	New Growth at Branch Tip (cm)	White wool Present (1) Absent (0)	Number of Egg Sacs On outermost 10cm
Tree Average Tree Number	Average New Growth (cm)	White wool Present (1) Absent (0)	Average Number of Egg Sacs



Home >

Harvard Forest > Schoolyard LTER Database

Schoolyard LTER Database

Download Data

Welcome to the Harvard Forest Schoolyard LTER Database. To view and download data, select a project and press Submit.

Project *	
	<input type="radio"/> Fall Phenology
	<input type="radio"/> Spring Phenology
	<input type="radio"/> Hemlock Woolly Adelgid
	<input type="radio"/> Vernal Pools
	<input type="radio"/> Streams
	<input type="radio"/> Forest Dynamics

Submit

You can access all your past data and other schools' too.

My method-

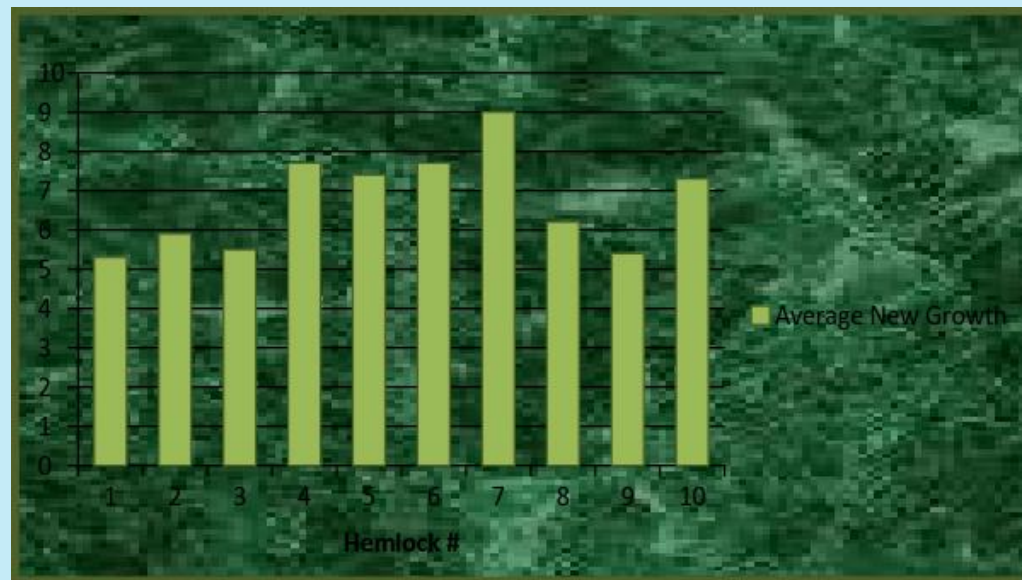
- I have six hemlock study trees. 1-6
- Each tree has ten branches marked A-J
- My students work in teams of four on one tree.
- They divide the branches up.
- Each student must complete a data sheet.
- They sit with their group in the classroom and we enter the data together on the IWB.





**Average
New
Growth**

hemlock#	cm
1	5.3
2	5.9
3	5.5
4	7.7
5	7.4
6	7.7
7	9
8	6.2
9	5.4
10	7.3
average	6.74



Assessment

Name _____ Date _____

HWA Data Collection Assessment Rubric

	3 Detailed, accurate, neat, and complete!	2 Legible; most information included Some detail	1 Difficult to read; Incomplete, No detail
Heading – group names (yours first), school, tree id, date			
Field Notes			
Data <ul style="list-style-type: none"> • tree crown health • presence/ absence of HWA • new growth measurements 			

Total points 9 My score _____

Teacher Comments

Name _____ Group # _____ Date _____

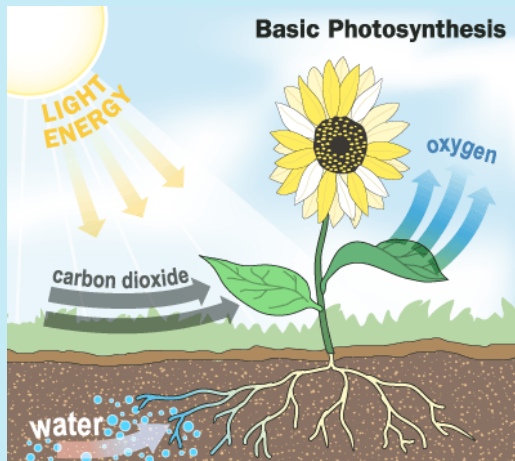
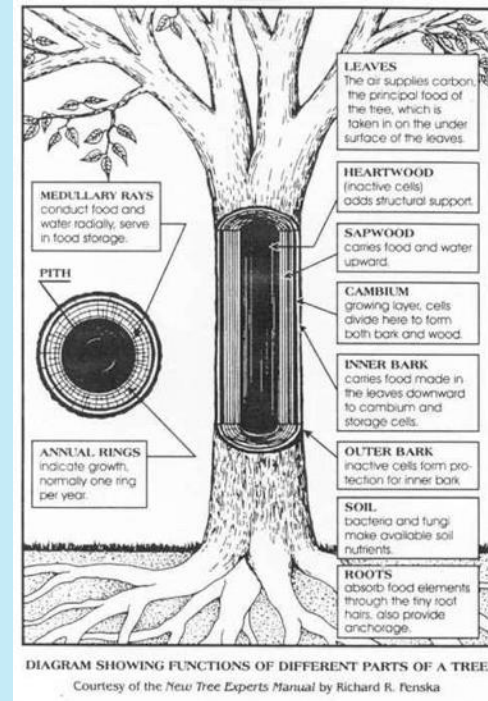
Field Work Assessment Rubric

	Always 3	Sometimes 2	Needs Improvement 1	Points
I showed respect for all living things in and around the area of fieldwork				
I stayed with my group at all times, displayed good teamwork, and settled disagreements peacefully				
I completed my assignment and my data sheet is neat, complete, and accurate				
I used materials and the field site safely and responsibly.				

Total Points _____

Student Comments

Teacher Comments



Integrate lots of science- basic plant physiology, processes and forest ecology in general

Plot Studies With Students

Under the Hemlocks

Under the Hardwoods



Group names _____ Date _____

Hemlock Plot ~ plants (small plants, grasses, moss, ferns)

Hemlock Plot ~ shrubs (with woody stems)

How Many?	Name of plant	Description
	moss cover	0 none 3 50-75% 1 1-25% 4 75-100% 2 25-50%

How Many?	Name of shrub	Description

Total # _____ # of Species _____

Total # _____ # of Species _____

Hemlock Plot ~ Fungi (mushrooms and other fungi)

Hemlock Plot ~ Seedlings and Saplings

How Many?	Name of fungus	Description

How Many?	Name	Description

Total # _____ # of Species _____

Total # _____ # of Species _____

Extending your study across the disciplines



Name _____ Date _____

Measuring Tree DBH (Diameter at Breast Height)
 Scientists measure the diameter of trees at 1.3 meters – the breast height of the average person. They use this to monitor the growth of the tree. Here are some rules for finding the DBH of your tree.

• First you have to find the circumference – the distance around the trunk.
 • Make sure you keep your measuring tape level as you go around the tree!
 • If your tree splits under 1.3 meters measure each side separately.
 • If your tree is leaning measure your 1.3 meters against the tree.

Now you are ready to measure!

Use your tape to measure the circumference of your tree. Remember scientists use centimeters!

Now use the circumference to find the diameter –

Diameter = Circumference ÷ 3.14 (π)

The DBH of my tree is _____ centimeters.



A Hemlock Tree Canopy

The hemlock tree's canopy
 Is like a roof above my head
 You can hide from your enemy
 I can use the branches as my bed
 All you have to do is rest your head
 And then you see
 A Hemlock tree canopy

Katherine Lemieux



Invasive Species Research





Search NISIC

- o Search all USDA
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Browse by Geography

- ▷ United States
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Browse by Subject



- ▷ Aquatic Species
- ▷ Plants
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- ▷ Economic Impacts
- ▷ Laws and Regulations
- ▷ Manager's Tool Kit
- ▷ Resource Library

You are here: Home

National Invasive Species Information Center (NISIC): Gateway to invasive species information; covering Federal, State, local, and international sources.

Invasive species are plants, animals, or pathogens that are non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause harm.
(See **What is an Invasive Species** for more information)

What's New on NISIC's Site:

- See **What's New** (recent five items rotating below)
- Subscribe to **NISIC - What's New**  

National Invasive Species Awareness Week (NISAW) – Feb 22-28, 2015

Current Invasive Species News (from various sources):

- Read **Invasive Species News**
- Subscribe to **Invasive Species News**  

SHARE     

I Want To...

- o See What's in My State
- o Find Out What I Can Do
- o What is an Invasive Species?
- o Find Images
- o Help to Control Invasive Species
- o More ...

Give Us Your Feedback 

Agricultural Research Service's Research on Invasive Species



Spotlights



Identify unknown species that may be invasive.



Calendar Invasive Species related Conferences



What You Can Do Learn how to prevent or



Education Invasive Species Resources for

Pink Hibiscus Mealybug





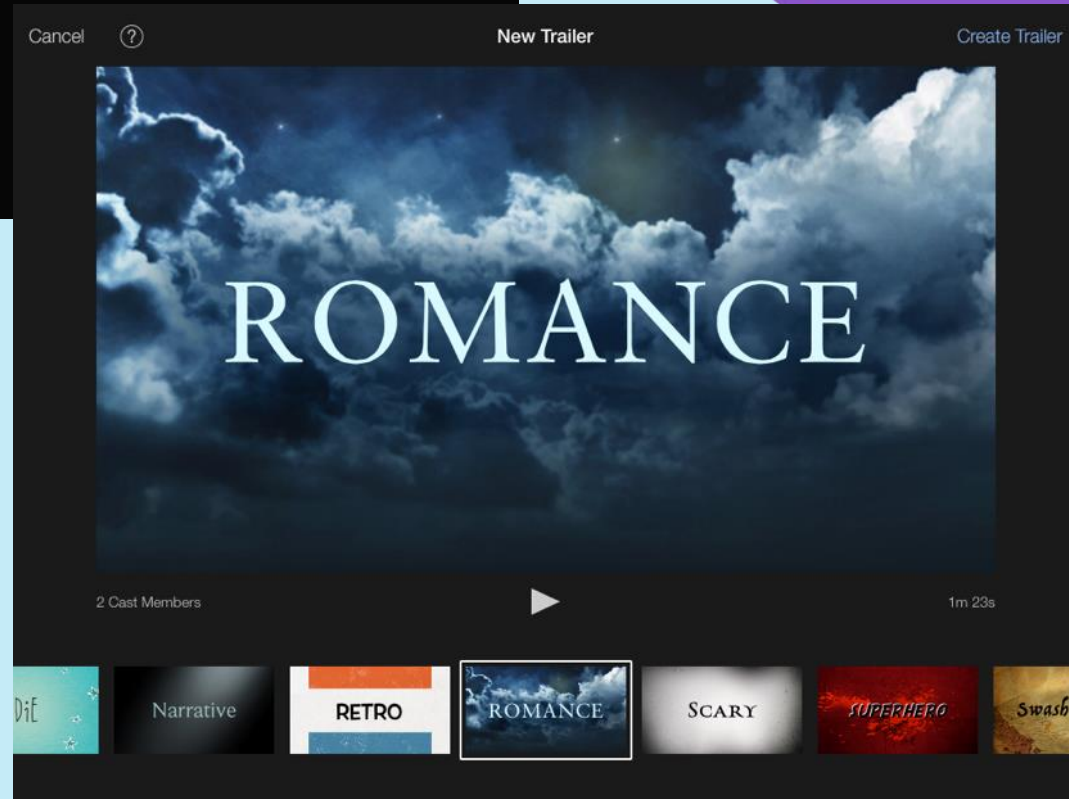
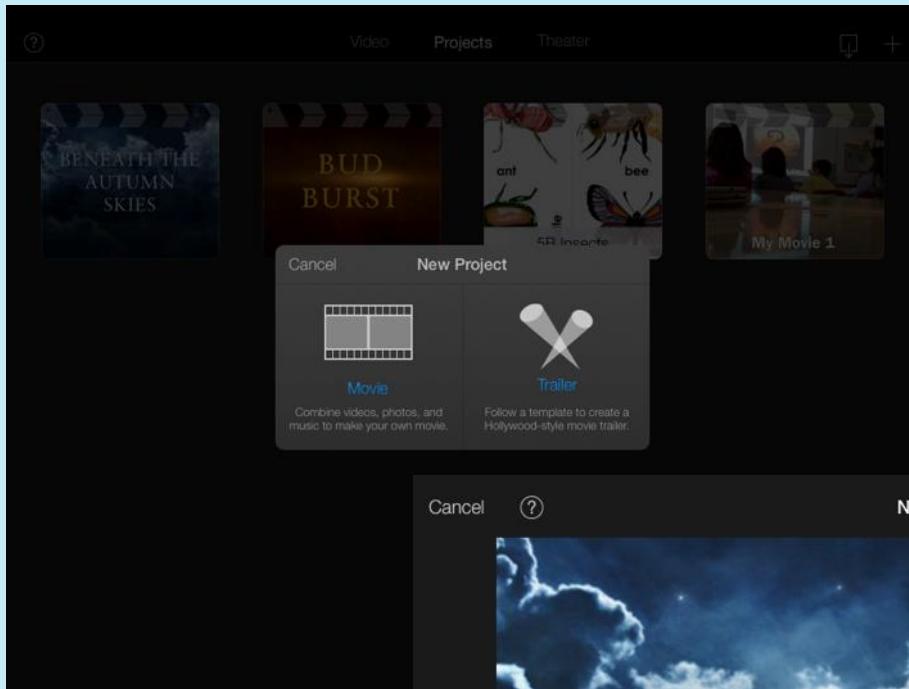
The Infestation

from **kbennett** 1 month ago / via **IOS 7** NOT YET RATED



	A	B	C	D	E	F	G
1	hemlock	1	2	3	4	5	average
2	plants	0	0	0	1	0	0.2
3	fungus	2	1	0	1	2	1.2
4	insects	3	1	3	2	1	2
5	soil temperat	11	12	10	10	12	11
6							
7							
8	hardwoods	1	2	3	4	5	
9	plants	20	25	35	37	20	27.4
10	fungus	1	3	2	1	2	1.8
11	insects	3	2	1	3	1	2
12	soil temperat	11	11	12	13	16	12.6
13							
14							







hemlock woolly adelgid

Web Images Videos News Shopping Maps Books

About 94,900 results

Any time

- Past hour
- Past 24 hours
- Past week
- Past month
- Past year

All results

Verbatim

Scholarly articles for hemlock woolly adelgid

- [Hemlock woolly adelgid](#) - McClure - Cited by 146
- [... response to the introduced hemlock woolly adelgid in ...](#) - Orwig - Cited by 357
- [Biology and control of hemlock woolly adelgid](#) - McClure - Cited by 147

Hemlock Woolly Adelgid - USDA Forest Service

www.na.fs.fed.us/fhp/hwa/ ▾
 The hemlock woolly adelgid (HWA) *Adelges tsugae* was first described in western North America in 1924 and first reported in the eastern United States in 1951 ...

Pest Alert - Hemlock Woolly Adelgid - USDA Forest Service

na.fs.fed.us/spfo/pubs/pest_al/hemlock/hwa05.htm ▾
 Hemlock Woolly Adelgid. Native to Asia, the hemlock woolly adelgid (*Adelges tsugae*) is a small, aphidlike insect that threatens the health and sustainability of ...

Images for hemlock woolly adelgid



Hemlock woolly adelgid - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/Hemlock_woolly_adelgid ▾
 Hemlock woolly adelgid (*Adelges tsugae*), or HWA, is member of the Sternorrhyncha suborder of the Order Hemiptera and native to East Asia. It feeds by ...
 Characteristics - Control methods - Significance - References

Invasive Species: Animals - Hemlock Woolly Adelgid (*Adelges tsugae*)

www.invasivespeciesinfo.gov/animals/hwa.shtml ▾
 A species profile for Hemlock Woolly Adelgid from USDA's National Invasive Species Information Center.

Hemlock Woolly Adelgid | UMass Amherst Landscape, Nursery ...

extension.umass.edu/landscape/fact-sheets/hemlock-woolly-adelgid ▾

About 45,800 results



US FOREST SERVICE ABOUT US CONTACT US Forest Service National Links

Northeastern Area

Forest Health Protection—Hemlock Woolly Adelgid

The hemlock woolly adelgid (HWA) *Adelges tsugae* was first described in western North America in 1924 and first reported in the eastern United States in 1951 near Richmond, VA.

Research scientists using molecular genetics have recently determined that several distinct populations of HWA occur in Asia and western North America and we now know that HWA populations found in the East originated from southern Japan. In their native range, these populations of HWA cause little damage to the hemlock trees they feed on as natural enemies and possible tree resistance has evolved with this insect pest.

In the absence of these natural control elements in eastern North America, this introduced insect pest attacks both eastern (Canadian) and Carolina hemlock which are often damaged and killed within a few years of becoming infested. HWA is now established from northeastern Georgia to southeastern Maine and as far west as eastern Kentucky and Tennessee.

Hot Topics

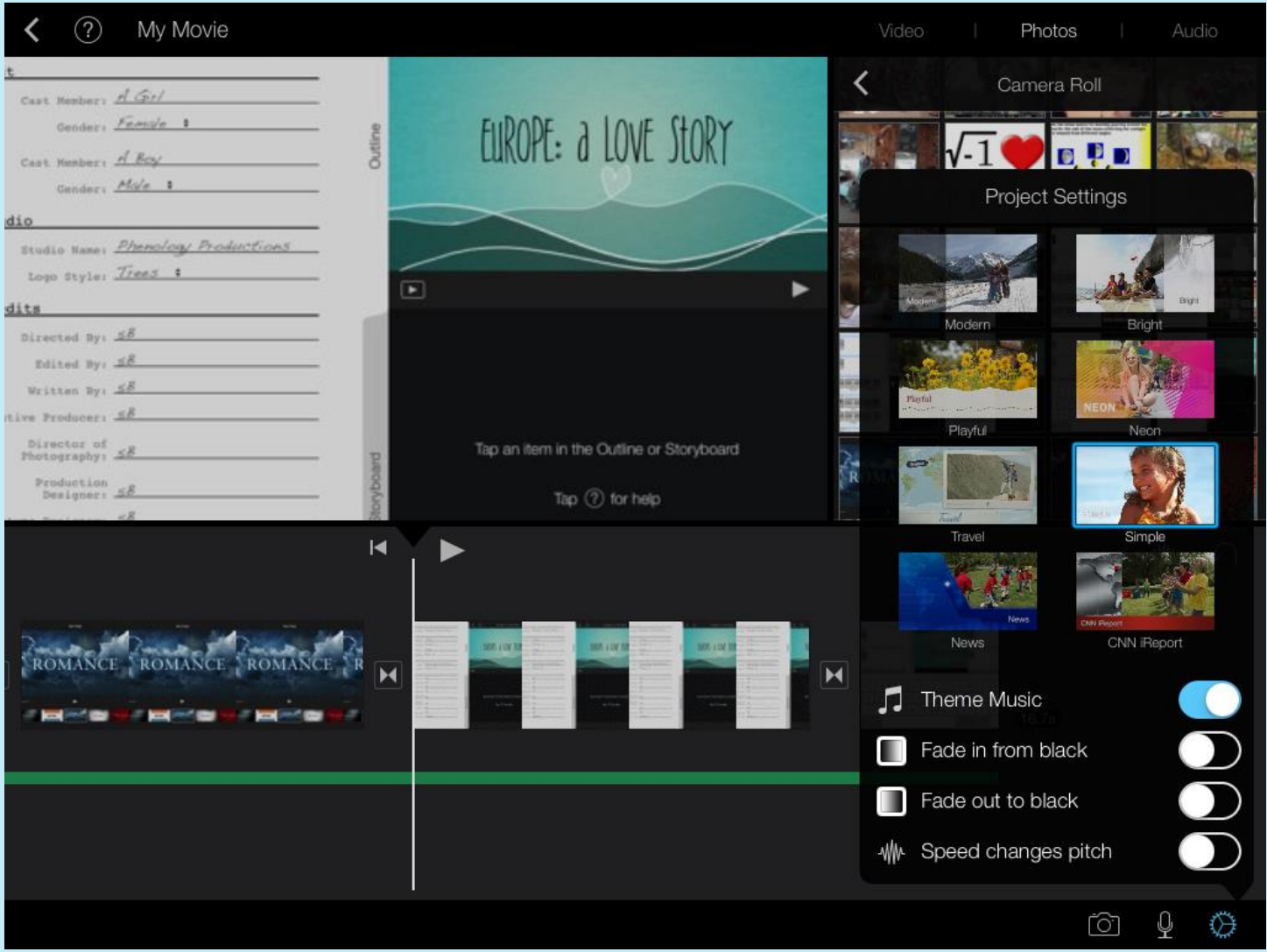
- [HWA Predator Release and Monitoring Database](#)
- [Implementation and Status of Biological Control of the Hemlock Woolly Adelgid-2011](#)
- [Fifth Symposium on Hemlock Woolly Adelgid in the Eastern United States—Asheville, NC, August 17-19, 2010](#)
- [Pest Alert: Tip Blight on Eastern Hemlocks](#)
- [Standardizing Sampling for Detection and Monitoring of Hemlock Woolly Adelgid in Eastern Hemlock Forests—Scott Costa and Bradley Orwig, FHTET-2006-16, October 2006](#)
- [HWA Bibliography Database](#)
- [HWA Initiative Strategic Plan 2014-2018](#)
- [HWA Communication Plan](#)

- Biological Control
- Ecology
- Chemical Control
- Control
- Distribution Maps
- Impacts
- Infestations
- Newsletters
- Other Hemlock Pests
- Other Links
- Photo Gallery
- Publications
- Quarantines
- Silvicultural Management
- State and Federal Reports
- Hemlock Woolly Adelgid Home

USDA

TDG

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credits

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with
your
own
awesome
choices.



Preview
your
greatness
😊

Access
the camera roll...

Record
video
in the
app!

kbennett

Joined 2 years ago



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You have not updated your profile yet.

Update your settings to change what appears here.



10x more storage space, unlimited HD videos, and full player customization

19

Videos

0

Likas

0

Following

0

Groups

0

Channels

0

Albums

Recently Uploaded

+ See all 19 videos



The Crayfish Olympics

1 week ago



The Infestation

1 month ago



HWA trailer

5 months ago



Beneath the Autumn Skies

7 months ago

Recent Activity

Using Google Earth to Survey the Hemlocks in your Town



Step 1 Students print out maps (black and white are fine) of their house and yard from the computer. *Make sure they have the latitude and longitude in decimals (under tools).

Using Google Earth to Survey the Hemlocks in your Town



Step 2 Students take this map home. With a parent they color in any areas that have hemlock trees with a green crayon.

Using Google Earth to Survey the Hemlocks in your Town



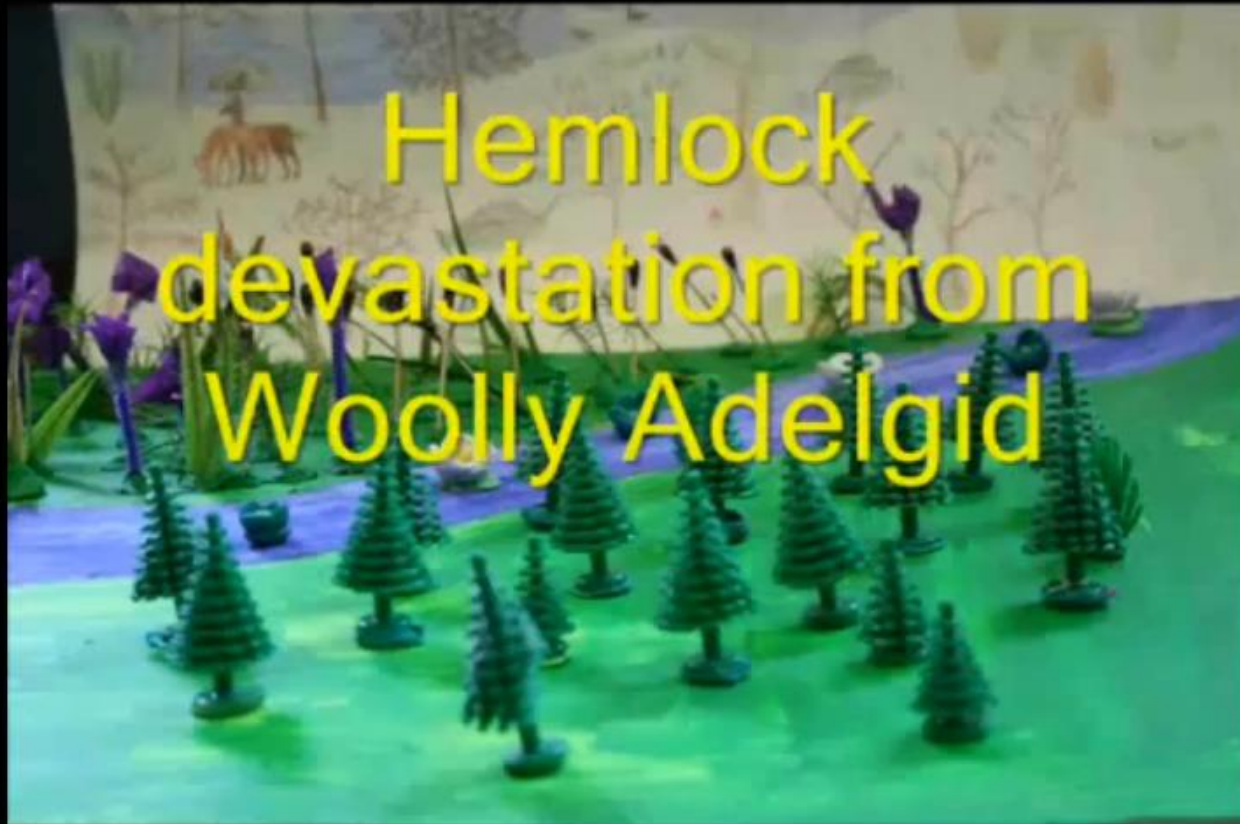
Step 3 Students check each hemlock carefully for adelgid. If they see adelgid on a tree, mark that tree with an x on their map. Then take a sample, a small piece of the infested branch and seal it in a ziplock bag. Have the students bring it in to school to do a positive identification under the microscope.

2012 Ash HWA
survey

Name	address	latitude	longitude	Hemlocks	HWA + -
Josslyn Bourque	40 Winding Cove Rd	42 40 23.20	71 58 18 53	no	-
Ean Roy	22 Liberty Ln	42 37 45.36	71 54 16.52	yes	-
Connor Fagan	43 Juniper Rd	42 37 41.73	71 55 32.58	yes	-
Nicole Snow	56 Lincoln Ave	42 38 57.66	71 57 04.42	no	-
Michelle Lim	28 Main St.	42 38 10.06	71 54 27.77	no	-
Kahlan Jones	7 Cross St.	42 36 41.40	71 56 15.63	no	-
Megan Brown	14 Holden St.	42 38 27.56	71 54 25.40	no	-
Henry Rittberg	13 South School St.	42 36 33.18	71 55 56.84	yes	-
Tyler Money	50 Gardner Rd.	42 36 23.33	71 56 53.04	no	-
David Rousso	228 East Rindge Rd.	42 41 49.85	71 57 14.10	yes	-
Mackenzie Nims	402 Ashby Rd.	42 40 51.40	71 53 02 49w	no	-
Gabby Thomas	24 Juniper Rd.	42 37 47.65	71 55 40 38	yes	-
Mike Sullivan	70 Cushing St.	42 38 35.83	71 54 58 33" W	no	-
Rachael Law	58 Corey Hill Rd.	42 37 49.25	71 55 30 61	yes	-
Chloe Jess	222 Chesnut St.	42 34 27.08	71 59 05 52	yes	-
Ethan Hindle	46 Central St.	42 37 52.14	71 54 38 96 W	no	-
Liv Kuehl	51 Young Rd.	42 41 08.93	71 57 34 19 W	yes	-
Tyler Antley	53 Winchendon Rd	42 38 11.83	71 55 32. 91 W	yes	-
Jacob Fowler	15 South High St.	42 36 28.14	71 56 35 23 W	no	-
Jake Packard	3 Kelton Rd.	42 38 20.54	71 53 51 25W	yes	-
Finn Picone	49 Willard Rd.	42 37 40.20	71 54 35.38	yes	-
Olivia scarborough	32 south high st.	42 36 24.29	71 56 43 32	yes	-
Jenna Oulette	4 Mattakesett Cir	42 39 50.33	71 54 02.28	yes	-
Ben Gauthier	5 Winding Cove Rd.	42 40 19.98	71 58 10.38	yes	-

Step 4 Students enter the latitude and longitude of their house from their map on to a spreadsheet. I like to use Google Docs so we can all do it together in the computer lab. Now you have a record of the hemlock trees and adelgid in town. You can add to the spreadsheet every year.

Hemlock devastation from Woolly Adelgid



1:18 / 2:28



Analytics

Video Manager



InvasiveSpecies The Movie



BUD BURST