

Harvard LTER Schoolyard Program

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



- Lesson Title: Woolly Bully LTER Planning Guide
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 - School: Amherst Regional High School-South East Campus
 - Level: High School-10th Grade
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Woolly Bully LTER Planning Guide

Objectives

1. Define an ecosystem as a biological community and the abiotic factors that affect it.
2. Collect and analyze data on biotic and abiotic factors in a hemlock and deciduous forest in order to compare and contrast each ecosystem.
3. Determine if the hemlock woolly adelgid is present at our local field site and if present, how the population size is changing.

4. Predict how the New England forest ecosystems could change if the hemlock forests are lost to the hemlock woolly adelgid.

Materials

PowerPoint: *Hemlock Woolly Adelgid and its Impacts on Forest Ecosystem* (Orwig)

Articles:

1. *Hemlock: Irreplaceable Habitat* (Orwig, D.)
2. *Loss of Foundation Species: Consequences for the Structure and Dynamics of Forested Ecosystems* (Ellison, et. al), pgs. 479-482. Answer the questions on handout.

Plot Study Handout

Rubric – Data Collection Group Work

Pencil

Clipboard

Tape to Mark Trees

Data Collection sheets – New Growth

Data Collection sheets – Plot Study

Dissecting Microscope

Hand lens

Soil Testing Kit (pH, N, P, K)

Soil thermometer

Plant and insect identification guides

2 Jars for collecting soil

Measuring tape

Graphing software such as Excel

Lab Report Guide

Enrichment assignment - Students can research and prepare a presentation on the loss of the Chestnut tree in the U.S. and the impact on forest ecosystems. Students can present this to the class, using the rubric on oral presentations as a guide.

Planning Guide

Day 1

Objective:

1. Describe the impact of the woolly adelgid on hemlock forests.

Assignment:

1. See PowerPoint: *Hemlock Woolly Adelgid and its Impacts on Forest Ecosystems* by David Orwig.

http://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/schoolyard12_orwig.pdf

Day 2

Objective

1. Practice collecting data on new branch growth and identification of “wool.”

Assignments

1. Measure and record data on new hemlock branch growth.
2. Examine the underside of infected hemlock branches with a magnifying glass dissecting microscope.

Day 3-4

Assignments

1. Collect data on new branch growth.
2. Record data in LTER database.

Day 5-6

Objectives

1. Describe the role of the eastern hemlock tree as a foundation species in the hemlock forest ecosystem.
2. Provide examples for how the loss of the hemlock as a foundation species could impact the environment and species in the hemlock ecosystem.

Assignments

3. Read and discuss the article *Hemlock: Irreplaceable Habitat* (Orwig, D.)
4. Read pages 479-482 from the article *Loss of Foundation Species: Consequences for the Structure and Dynamics of Forested Ecosystems* (Ellison, et. al). Answer the questions on handout.

Day 7

Objective

1. Discuss the role of the hemlock tree, and other native species, to our human experience.

Assignments

1. Read the poem *Dust of Snow* by Robert Frost.

2. Hold a class discussion in which students interpret the meaning of the poem. Ask students to relate this to personal experiences in nature.

Days 8-12

Objectives

1. Collect and analyze data on biotic and abiotic factors in a hemlock and deciduous forest in order to compare and contrast each ecosystem.
2. Predict how the New England forest ecosystems could change if the hemlock forests are lost to the hemlock woolly adelgid.
3. Summarize and share your plot study report with the school community.

Assignment

1. Wildlife Species Associated in Hemlock Forests – Create a Fact Sheet
2. Plot study – A Comparison of the Ecology of Hemlock and Deciduous Forests
 - a. Collect data at each field site.
 - b. Graph and analyze data using excel.
 - c. Write a formal lab report based upon your plot study.
 - d. Create a poster that summarizes your lab report.