Harvard LTER Schoolyard Program

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

Lesson Title: Changing Forests Project Challenges and Successes 2013-15

Project: Our Changing Forests
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School: Oakmont High School
Level: High School
Date: April 9, 2015
Changing Forests
Changing Forests So Far

- 3 seasons of data collection
- 3 field sites
- 7 species of tree
- 61 total trees
- 116 samples
- That should make for a great data set, right!?!
Current Protocol

- Identify Tree species and ID number and record
- Find the highest side of the tree
- Place the DBH stick up to the tree, measure the tree, and record
Problems with Data

- Measurements are extremely inconsistent between groups
  - Could be due to poor measurements or measuring from different sides of the tree
- Some trees seem to have shrunk and grown magically!
  - There is no record of trees that have lost bark, which might explain some of the shrinking on dead trees
Possible Solutions for Field Protocol

- Field sites are set up with all tags facing the same direction
So We Could!

- Have students measure from the tagged side of the tree.
And!

- Have students take pictures of their measurements to go into a digital record.

Could be done either as one or two pictures.
Solutions continued…

- Modify data collection sheets so that there is a column for tree damage.

<table>
<thead>
<tr>
<th>Date (MM/DD/YYYY)</th>
<th>Tree ID Number</th>
<th>Species</th>
<th>Living or Dead</th>
<th>Bark Damage</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

- Considered giving previous years data but am concerned that might cause an accelerated growth of the trees.
Updated Protocol

- Identify Tree species, ID number and record.
- Place the DBH stick up to the tree on the side that is tagged.
- Look at DBH height for any bark damage and record if there is any.
- Measure the DBH and record on data sheet and with a picture.
- Write picture number next to entry
Got the Data, Now What?

- Time to do some graphing and analysis!
- Students need appropriate level graphs to get them engaged in the data analysis
  - Could be teaching Honors one semester and Essentials the next.
Simple Graphs

- Start with paper graphs before going to excel
- Graphs that deal with totals
- Using multiple smaller graphs to compare data
- Look at carbon sequestration of a single tree and compare
Number of Trees by Species in Schoolyard Phenology Study Plot # 1

Number of Trees by Species in Schoolyard Phenology Study Plot # 2

Number of Trees by Species in Schoolyard Phenology Study Plot # 3

Growth of Tree Number 11 Red Maple
Advanced Graphing

- Start Directly on Excel
- Work with larger data sets and work with averages
- Compile data onto a single graph
- Look at total carbon sequestration, sequestration by plot, and by species as well.
Number of Trees by Species in Harvard Forest Study Plots

- Plot 1
  - White Pine: 20
  - Beech: 4
  - Red Maple: 1
- Plot 2
  - White Pine: 9
  - Beech: 4
  - Red Maple: 1
  - Paper Birch: 1
- Plot 3
  - White Pine: 10
  - Beech: 4
  - Red Maple: 1
  - Red Oak: 1
  - Eastern Hemlock: 1
  - Witch Hazel: 1
  - Unknown: 1

Number of Trees in each species:
- White Pine: 39
- Beech: 9
- Red Maple: 3
- Paper Birch: 1
- Red Oak: 1
- Eastern Hemlock: 1
- Witch Hazel: 1
- Unknown: 1
Average DBH of Harvard Forest Study Trees by Species