



## Harvard LTER Schoolyard Program

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

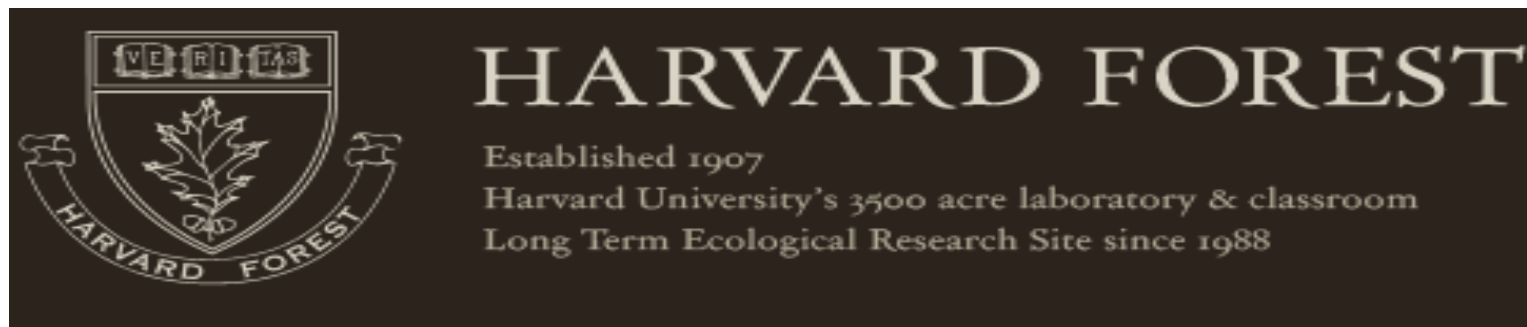
- Lesson Title: Buds, Leaves, and Global Warming Intro.
- Teacher/Author: April LeSage
- School: Wahconah High School
- Level: High School
- Date: April, 2013



# Buds Leaves and Global Warming

At Wahconah Regional High School  
in affiliation with Harvard Forest

April LeSage



# LTER

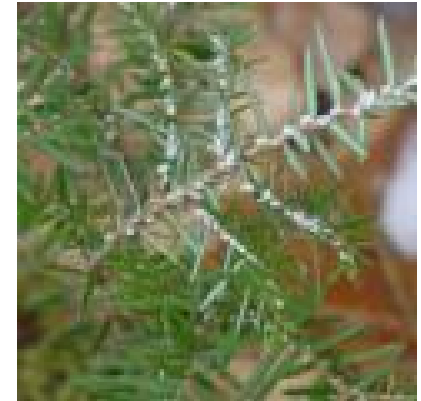
- Long Term Ecological Research Projects
- Studies imbedded in conservation and ecological issues (local, nation, and world wide)
- Field work, observations, and data easily gathered and able to be processed in several ways and easily accessible
- Addresses the “big questions”
- Supported by NSF





# ILTER at Harvard Forest

- Several projects including
  - Buds, Leaves, and Global Warming
  - Woolley Bully-Invasive Pests
  - Water in the Landscape-Vernal Pools
- Focus on Buds, Leaves, and Global Warming
  - How long is the growing season in our schoolyard?
  - How is the length of the growing season related to climate?



# ILTER at Wahconah

- Established in 2012 with the *Buds Leaves and Global Warming Protocol* in affiliation with Harvard Forest
- Two Ecology Classes involved in collecting and analyzing data
- Fall Protocol-Leaf coloration and leaf drop
- Spring Protocol-Expansion and opening of buds



# Practice

- Pre-Lesson Unit/Activities
- Tree identification
- Phenology lesson
- Leaf data and measurements
- Forest ecology
- Carbon sequestration



# The Fall Protocol



- Students will record the progression of leaf color and leaf drop to monitor the end of the growing season
- Data collected 1-2 times per week
- Data collections include using the same branch and 6 leaves of a specific tree
  - Measure leaf length
  - Record observations of color change/leaf drop
  - Record whole tree color change/leaf drop

# Gathering Data

- Students worked in groups of two throughout the season a minimum of twice per week collect data
- Responsible for measuring leaves, sketching, recording color change of branches, and leaf drop





# Student Work



- Students created a notebook for the project
- Data records stayed in classroom
- Students worked in pairs so when a student was absent the data was still recorded

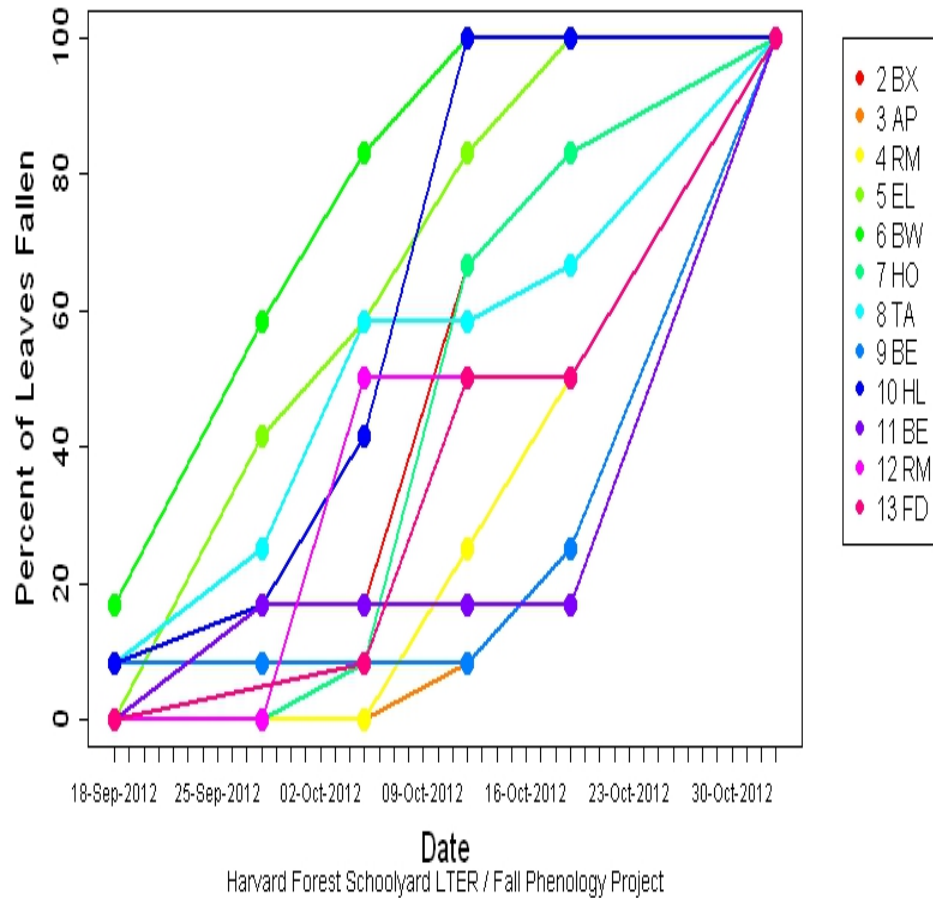
# Data Entry

- Data entry was initially completed by students
- Many issues came up with students inputting the data
- Teacher input 2012 fall data

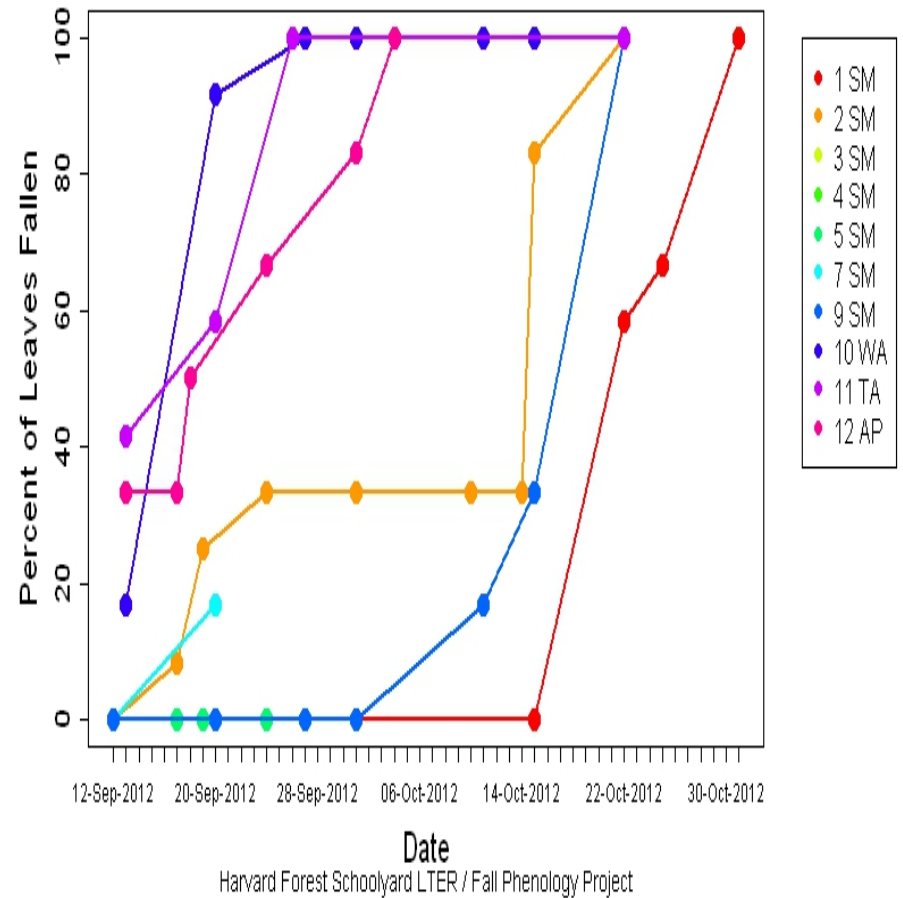


# Graphing and Analyzing

Silvio Conte Community School



Wahconah Regional High School



# The Spring Protocol

- Students will record the progression of bud swelling and bud burst to monitor the start of the growing season
- Data will be collected 1-2 times per week
- Data collections include using the same branch and 6 leaves of a specific tree
  - Record/observation of buds
    - Closed
    - Puffy
    - Open
  - Measure leaf length



# Practice

- Forced Bud Burst Activity
- Practice Data Sheets
- Leaf measurement















# What's Next

- Conservation and Ecology
  - Work on the spring protocol this year
  - Continue same protocol next year
  - Students input data
- Honors Environmental Science Class
  - Fall and Spring protocol
  - Phenology unit
  - Climate Change in relation to local bioregion

# Sources

- "Harvard Forest K-12 & Schoolyard LTER Project." *Long Term Ecological Research*. The President and Fellows of Harvard College. Web. <<http://harvardforest.fas.harvard.edu/research-projects>>.
- "LTER Description." *National Science Foundation*. N.p.. Web. 10 Apr 2013. <[http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=13449](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13449)>.
- Riebeek , Holli. "NASA Earth Observatory Global Warming." NASA. N.p., 11/05/2007. Web. 8 Nov 2009. <[earthobservatory.nasa.gov/.../GlobalWarming/global\\_warming\\_2007.pdf](http://earthobservatory.nasa.gov/.../GlobalWarming/global_warming_2007.pdf)>.
- "The LTER." *The Long Term Ecological Research Network*. University of New Mexico, Albuquerque, NM, USA 87131. Web. <<http://www.lternet.edu/site-brochures>>.