

LONG TERM SCHOOLYARD ECOLOGY TEACHER RECOGNITION CEREMONY

Sally
Farrow

Mary
Reed

Elisa
Margarita

Emilie
Cushing

Kate
Bennett



5 Year Schoolyard Ecology Teacher Honorees

Certificate of Achievement

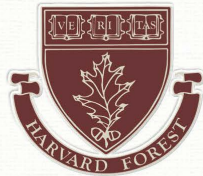
AWARDED TO

Mary Reed

FOR 5 YEARS OF DEDICATED SCHOOLYARD ECOLOGY PROJECT LEADERSHIP

BUDS, LEAVES, AND GLOBAL WARMING

APRIL 9, 2020



Pamela M. Snow

Pamela M. Snow
Schoolyard Ecology Coordinator

Presenter:

Harvard Forest
Schoolyard Eco. Spring
Workshop for Teachers
2019

Website
Contributions:

Lesson plans and
student HF website

Mary Reed

St. Mary's Parish School

Buds, Leaves & Global Warming Leaf Structure

Name: _____

Draw your leaf as you see it through the microscope lens.
Be sure to use the whole page. Label the veins and the cells.



Write two observation sentences about what you see through the microscope.
*There are pretty big cells just un like most other leaves.
The leaf looks very scaly like a reptiles scales.*



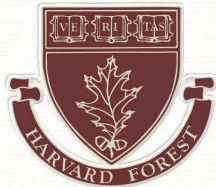
Certificate of Achievement

AWARDED TO

Sally Farrow

FOR 5 YEARS OF DEDICATED SCHOOLYARD ECOLOGY PROJECT LEADERSHIP
OUR CHANGING FORESTS

APRIL 9, 2019



Pamela M. Snow

Pamela M. Snow
Schoolyard Ecology Coordinator

Presenter:

Harvard Forest Schoolyard
Eco. Spring Workshop for
Teachers Multiple Years

Website Contributions

Education Awards:

Excellence in Environmental
Education- Mass. Office of Env. And
Energy

Mass. Assoc. for Science Teachers
(MAST)

Sally Farrow

Drumlin Farm and Lowell High School
Massachusetts Audubon Society

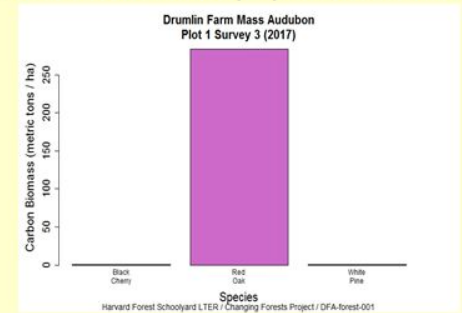


Changing Forests at Drumlin Farm 2014-2017

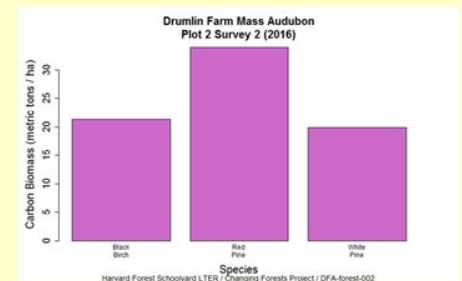
Plot #1 at the east end of Vernal Pool #1



Carbon Biomass by Species Plot # 1



Wildlife Biologists measuring DBH
Plot #2 with Carrie Lang of HF



Carbon Biomass by Tree Species Plot # 2



Presenter:

Mass. Assoc. Science Teachers (MAST)

Harvard Forest Schoolyard Eco. Spring Workshop for Teachers Multiple Years

Website Contributions

Education Awards:

Excellence in Environmental Education-
Mass. Office of Env. And Energy

Mass. Assoc. for Science Teachers
(MAST) Our Changing Forests
Highstead Mini Grantee

Host: Wade Institute for Science
Teaching Summer Institute

Emilie Cushing

Glen Urquhart School



Mass EOEA Excellence in Environmental Education Award



Mass. Association of Science Teachers Conference Presenter (above)



Harvard Forest Spring Workshop for Teacher Presenter –Right

Certificate of Achievement

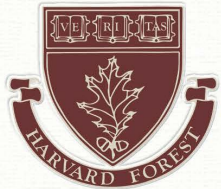
AWARDED TO

Elisa Margarita

FOR 5 YEARS OF DEDICATED SCHOOLYARD ECOLOGY PROJECT LEADERSHIP

BUDS, LEAVES, AND GLOBAL WARMING

APRIL 9, 2020



Pamela M. Snow

Pamela M. Snow
Schoolyard Ecology Coordinator

Contributes
Southern Most
Dataset for the Buds,
Leaves and Global
Warming Project from
the most urban site in
our network!

Online
Contributions:
Student Graphs
Teacher Graphs
Blog photos and
comments

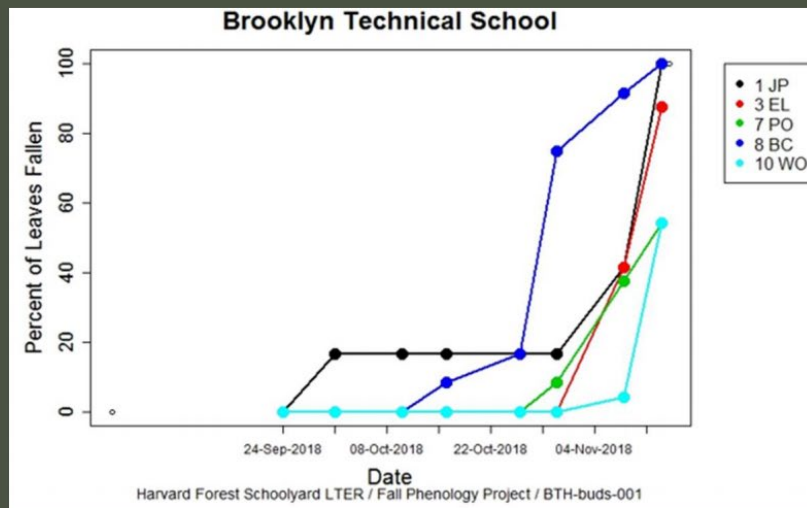


Elisa Margarita

Brooklyn Technical School

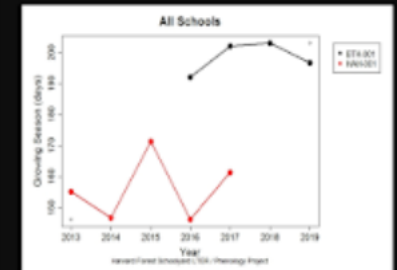


Figure 15: Timing of Leaf Fall at Brooklyn Technical School 2018



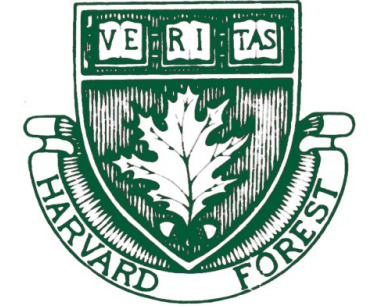
Compared a northern most school to our school

Used the HF graphing tool first and will let students who are comfortable with Excel graphing give that a try



Brooklyn Technical High School Teacher, Elisa Margarita, chose to adapt the new online graphing tool exercises for use by her students. Above are some excerpts from what she was able to draft during the data workshop, using her school's *Buds, Leaves, and Global Warming* project data and the northern most site as found on the field site map and data base. Elisa will also incorporate some of the content from Dr. Betsy Colburn's workshop slides to help students better understand visualizations of project data.

Katherine Bennett Career Service Recognition



Honoring 15 Years of Dedicated Leadership of Schoolyard Ecology

Woolly Bully and the Hemlock Teacher

Engaged hundreds of 5th and 6th grade students in tracking the presence of the Hemlock Woolly Adelgid in Ashburnham over 15 years.

Related student learning included:

Mini plot and snow depth s
Hemlock vs. Hardwood
studies

Invasive species video
creation

Insect pit trap studies





Buds, Leaves, and Global Warming Teacher



Mentor Teacher



Tips for Successful Field Experiences

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

Publications

Citizen Scientists
Fifth graders work as researchers on the hunt for an invasive species.
 By Katherine Bennett

When a colleague called me in 2004 to invite me to a four-day summer institute at a forest ecology research center, I jumped at the opportunity. I am an elementary math and science teacher with a limited science background but a passion for nature and the environment. These few days of training started a journey that developed into a profound teaching and learning experience for both my fifth-grade students and me. We would become citizen scientists, participating in an important ecological study with distinguished scientists—on our school's own nature trail!

The Harvard Forest Schoolyard Ecology Program provides teachers and students with the opportunity and materials to participate in regionally focused ecological studies under the guidance of a mentor scientist working on a similar study. The Harvard Forest is part of a national network of ecological research sites known as the Long Term Ecological Research Network (LTER). The study it offers are inquiry-based and incorporate science education best practices. I chose Woolly Bully: The Invasive Pest, *The Hemlock Woolly Adelgid* (HWA), *Adelges tsugae*, to study the hemlock trees in our school yard for its presence. Our mentor scientist, Dr. David Orwig of the Harvard Forest, has been studying this invasive pest since 1995 and mapping the range of the insect as it appears in New England. He also has long-term experiments that mimic the disappearance of hemlock trees to study the forest response. The students were introduced to the insect and Dr. Orwig's work by the scientist himself on a field trip to the Harvard Forest in September. Four times a year, my students monitored the hemlock trees on our nature trail for signs of the insect.

32 Science and Children

National Science Teacher Association Journal

Project BudBurst
 Timing is Everything!

About Observing Plants Partners Education Science

BudBurst Education Phenology 101 for Educators

Welcome to Phenology 101 for Educators

The Phenology 101 for Educators educational materials are divided into three units, each with a background guide, hands-on activities, and videos.

The materials are all in draft form. Please share any feedback, including suggestions, with us at budburstinfo@neoninc.org that can be used to improve the final version.

Unit 1: What is Phenology?
[Introduction to Phenology PDF](#)
[Intro Trailer Movie - Activity](#)
[PBB Single Report - Activity](#)
[1B The Stories Plants Tell - YouTube Movie](#)
[3B Changing Climates - YouTube Movie](#)

Unit 2: How can we (scientists and citizens) monitor phenology?
[Monitoring Phenology PDF](#)
[Cam Location - Activity](#)
[Season Spotter Images - Activity](#)

[Measuring Plant Phenology from Ground to Space - YouTube](#)
[Invisible: Introduction to Spectral Remote Sensing - YouTube](#)
[Tutorial: Marking Polygon Features - YouTube Movie](#)
[Tutorial: Editing Polygon Features - YouTube Movie](#)

Downloading PhenoCam Photos

Activity Ideas

PhenoCam Image Activities

1. Make PhenoMovie Trailers (Phenology 101 Unit 1 Activity - <http://budburst.org/phenology-101>)

2. Use PhenoCam images to compare the timing of major phenological events in different latitudes, elevations, or climates.

Site Name	Latitude
shenandoah	38.5926
national capital	38.8882
usgsreston	38.9471
woodshole	41.5495
caryinstitute	41.7839
northattleboroma	41.9837
springfieldma	42.1352
ashburnham	42.5378
hubbardbrook	42.6029
arbutuslake	43.9439
bartlett	43.9821
queens	44.0646
	44.565

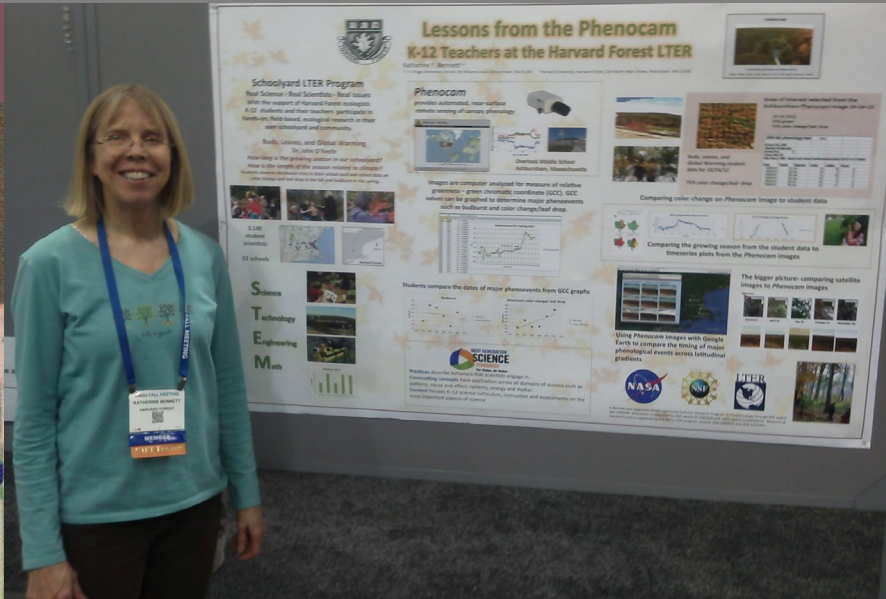
Research Experience for Teachers (RET) with Aaron Ellison



- Co-Authored paper

Conference Presentations

ILTER –All Scientists Mtg; American Geophysical Union;
National Science Teachers Assoc. ; Mass. Inst. For
Teaching Science...





Secretary's Award for
Excellence in Environmental Education, Massachusetts
Executive Office of Environmental Affairs

Awards



New England Environmental
Educator Award



Nashua River Watershed
Association Education Award

Introduction

Below, we provide links to some of the educational resources that have been developed through our collaboration with Project Budburst, the PhenoCam web page, and engage students in creative exploration of PhenoCam data.

There are numerous other educational resources related to phenology that are available online. These include:

- NEON Education maintains a [web page](#) containing links to tutorials focused on phenology and the data skills needed to ask phenology questions.
- The Harvard Forest Schoolyard LTER program maintains an extensive set of phenologically-related lesson plans and associated materials.
- Nature's Notebook, a program of the USA-National Phenology Network, has a large number of educational resources for both K-12 and college-level students.

Project Budburst's *Phenology 101 for Educators*

Unit 1: What is Phenology?

This collage includes:

- A poster titled "Phenology 101 for Educators" with the subtitle "Introduction to Phenology".
- A document titled "Introduction to Phenology Activity" with the subtitle "Create a Phenology Movie Trailer".
- Another document titled "Introduction to Phenology Activity" with the subtitle "Make a Plant Observation".
- A YouTube video thumbnail titled "The Stories Plants Tell: The Stories of Phenology" with the subtitle "Phenology 101 Video: The Stories Plants Tell".
- A YouTube video thumbnail titled "Changing Climates: What's a Plant to Do?" with the subtitle "Phenology 101 Video: What's a Plant to Do?".
- A document titled "Project Budburst Single Report".

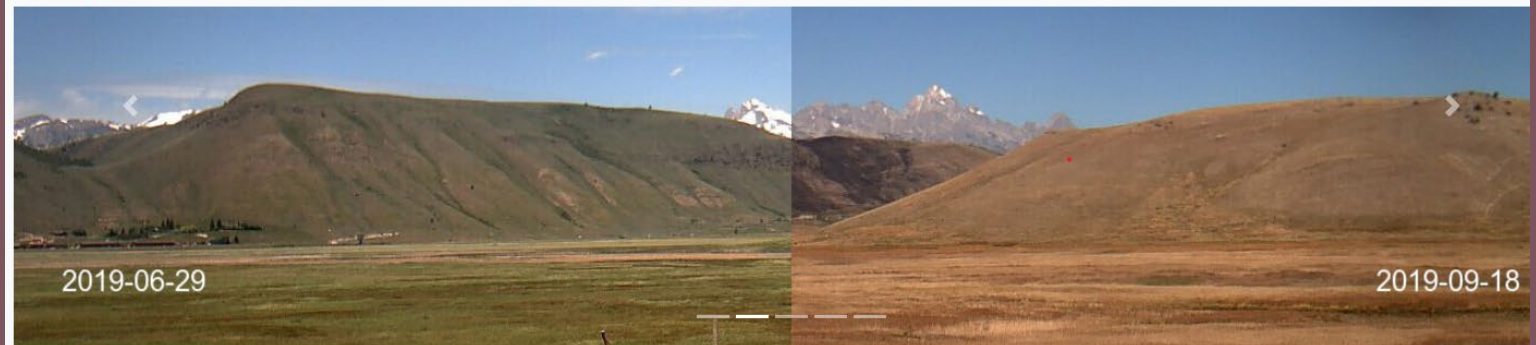
Unit 2: How can we (scientists and citizens) monitor phenology remotely?

This collage includes:

- A poster titled "Phenology 101 for Educators" with the subtitle "Monitoring Phenology".
- A document titled "Monitoring Phenology Activity" with the subtitle "Exploring the PhenoCam Locations".
- Another document titled "Monitoring Phenology Activity" with the subtitle "Classify Images with Season Spotter".
- A YouTube video thumbnail titled "PHENOLOGY" with the subtitle "Phenology 101: Measuring Plant Phenology from Ground to Space".
- A YouTube video thumbnail titled "Spectral Remote Sensing" with the subtitle "Phenology 101: Mapping the Invisible: Introduction to Spectral Remote Sensing".
- A document titled "Marking Features" with the subtitle "Phenology 101: Season Spotter Tutorial: Marking Polygon Features".

NSF Funding Now:

Lead Education Mentor for Cross Site Phenocam Workshops-NAU and Harvard Forest



Welcome!

The PhenoCam Network is a cooperative continental-scale phenological observatory that uses imagery from networked digital cameras to track vegetation phenology in a diverse range of ecosystems across North America and around the World. PhenoCam was established in 2008 and currently includes of over 500 sites. The image archive includes over 30 million pictures. Imagery and data are made publicly available in near-real time through this web page.

Data from PhenoCam can be used for phenological model validation and development, evaluation of satellite remote sensing data products, benchmarking earth system models, and studies of climate change impacts on terrestrial ecosystems.



PhenoCam Image Activity Ideas (cont.)

3. Compare rural and urban sites to look at the urban heat island effect. For example, you could have students compare the images from Ashburnham, MA to those from Boston Common.

Ashburnham
October 7, October 17, October 25, November 7, November 19

Boston Common
October 9, October 25, November 8, November 16, November 24

Background Information: Urban Heat Island
As developed areas expand, the amount of heat retained also grows. In turn the amount of air that is warmed, expands. This is process is sometimes referred to as the "Urban Heat Island Effect". This compounding warming effect in turn triggers variability in phenophase timing. A red maple (*Acer rubrum*) in a developed area, may experience initial stages of the leaves unfolding sooner than a red maple in an undeveloped area. On a smaller spatial scale, a red maple next to an asphalt road, may also flush sooner than a red maple that is close to the interior of a forest, or to a stream filled with cool running water.

Tweets by @PhenoCam

The PhenoCam Network Retweeted

Bijan SeyedNasrollah @DrEcoInfo
Using @PhenoCam, we showed #greenup #phenology is more sensitive to warming in

Post-Retirement...

- **Show and Tell by Ashburnham Westminster Regional Schools, Massachusetts:** This program seeks to get students excited about science through authentic research. Fourth- and fifth-grade students will collect, analyze, and share NEON-like data to answer the question: "Is the growing season changing?"

NEWS RELEASE



Ashburnham Westminister Regional School District

ASHBURNHAM, MA (Jan. 17, 2020)—A group of scientists is hard at work, collecting and analyzing data on the local growing season. When do flowering plants bloom? When do trees bud out and lose their leaves? How does the timing of these events affect pollinators and people? To answer their questions, the scientists search a database created by researchers from across the country, and compare local and national data. All in a day's work, and nothing unusual ... until you realize that these scientists are students at Briggs Elementary School in Ashburnham, Massachusetts.

BATTELLE NEWS RELEASE

Battelle Grants Enable Student Projects to Learn with National Ecological Observatory Network Data

COLUMBUS, Ohio (Jan. 15, 2020)—Battelle announced today that its inaugural NEON STEM Grant Program will fund \$100,000 worth of research around the country, enabling five projects to leverage the data collected by the [National Ecological Observatory Network](#) (NEON).

Congratulations to All of our Long Term Schoolyard Ecology Teachers

You continue to renew us all, and deepen the learning experience of our entire Schoolyard Eco learning community, while directly reaching more and more students each year.

Much Gratitude from the entire Schoolyard Ecology Team at
Harvard Forest