Taking Phenology Education to the Next Level!

Leveraging Phenocam Resources for Schools

Featuring the work of Schoolyard Teacher, Katherine Bennett, in collaboration with PhenoCam, NEON, and Project Budburst

Compiled by Pamela Snow
Harvard Forest Schoolyard Ecology
Long time Harvard Forest Schoolyard Ecology teacher, Kate Bennett, contributed to some of the Project BudBurst’s web resources available at:

http://budburst.org/phenology-101
Kate has developed lesson plans and educational activities to engage K-12 students in the science of phenology as part of Harvard Researcher, Andrew Richardson’s, Phenology research and outreach over the past several years.

This educational resource work has been funded by grants from agencies including National Oceanic and Atmospheric Administration (NOAA) and the National Ecological Observatory Network (NEON).
Phenocam Connections

Monitoring Phenology Activity

Exploring the PhenoCam Locations

Introduction
In this activity, students become familiar with the PhenoCam website and the network by comparing the images from diverse PhenoCam locations. They will locate and explore the PhenoCam gallery, map, and site table.

Estimated Time: One 60-90 minute class period
Suggested Grade Level: Grades 5-9
Materials: Access to computers and the internet for research, PhenoCam Student Recording Sheet (one per student)
Preparation: Make photocopies of the PhenoCam Site Table Recording Sheet (on page 4), prep for PhenoCam online access - copy link onto school website

Learning Outcomes
Students will be able to:
- Navigate the PhenoCam website and complete a chart recording latitude, longitude, elevation, terrain, urban-rural suburban classification, water features, and vegetation of eight diverse PhenoCam sites.
- Answer open-ended questions concerning the effects of climate change on plant phenology and ecosystem functions.

Background Information
PhenoCam (phenocam.unh.edu) is a network of digital cameras that are used to record vegetation phenology, in terms of seasonal changes in the greenness of the canopy. Cameras record digital images hourly over the course of a year at all the PhenoCam locations. The images are computer analyzed for color and generate a numerical value of canopy greenness which is then a part of a timeseries graph. Scientists can then identify major phenophases such as budburst from these graphs. The core sites include images of forest canopy, shrubs, grasslands, and cropland. There are urban, suburban, and rural sites.

Finding more information on PhenoCam?
Check out the website: phenocam.unh.edu

Introduction to Phenology Data

Downloading PhenoCam Images

Activity Instructions

Create an Account
1. Go to the PhenoCam website. Click on the data tab. It will bring you to this page (see image below). Before you can download data you have to set up an account. It's easy and free - then you can log in.

PhenoCam - Login

Please login to access the download page.
Username: 
Password: 

Forgot password? Reset it
Not member? Register!

PhenoCam Photos and Data Check out the other Unit II Introduction to Phenology Data materials
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.

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenandoah</td>
<td>38.5926</td>
</tr>
<tr>
<td>National Capital</td>
<td>38.8882</td>
</tr>
<tr>
<td>Ursineston</td>
<td>38.9471</td>
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<tr>
<td>Woodholle</td>
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<td>Caryinstitute</td>
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<td>Northtellerom</td>
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<tr>
<td>Springfieldma</td>
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<td>Ashburnham</td>
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<td>Hubbardbrook</td>
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<tr>
<td>Bartlett</td>
<td>44.0646</td>
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<tr>
<td>Queens</td>
<td>44.3685</td>
</tr>
</tbody>
</table>

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.

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 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.
More Phenology Resources:

Only a small sample of these educational resources are featured here.

For more Project Budburst resources, go to:
http://budburst.org/phenology-101

For the Phenocam website, go to:
http://phenocam.sr.unh.edu/webcam/

For phenology lesson plans from Kate Bennett, go to:

- Bennett. 2011. Phenology and student scientists: part I and part II.
- Bennett. 2012. Phenology and student scientists (5th grade).

For more on Harvard Forest’s Phenology project, go to:
http://harvard.edu/buds-leaves-global-warming