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 every half hour 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 time series 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.

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

Left: Map of PhenoCam locations around North America. Yellow pins represent core sites. Blue pins show affiliated sites.
Exploring the PhenoCam Locations

Activity Instructions

Task 1: Introduce PhenoCam

1. Activity Introduction.
Explain to the students that they will be learning to navigate the PhenoCam website and exploring some of the different locations on the website. They will be examining the images of eight different locations they choose on the PhenoCam gallery and map and record latitude, longitude, elevation, terrain, urban-rural-suburban classification, water features, and vegetation.

2. PhenoCam Website Introduction.
Open the PhenoCam website. http://PhenoCam.sr.unh.edu/webcam/. Go to the “About” tab and give the students some time to read about the PhenoCam project.

3. Navigate to the Photo Gallery.
Demonstrate how to open the photo gallery by clicking on the “gallery” option in the top menu and show the variety of different locations. Clicking on each location will bring you to that site’s page.

Activity Guide
budburst.org/phenocam
Task 1: Introduce PhenoCam (continued)

4. Explore the individual PhenoCam site pages.
On the site’s page it shows you the location, the most recent image, the last six images, and the Google earth view. This page also contains the location, latitude, longitude, and elevation - all needed for the students’ charts. There are also links to the vegetation “greenness” (GCC) graph and all the images that have been taken at that site. The GCC graph page also lists the vegetation- needed for the student chart.

Task 2: Complete the Site Comparison Chart

5. Handout the Site Comparison Chart sheets (on next page)

6. Select sites from the Site Map or Site Table.
Students can choose their sites from the gallery- and probably will! They should also look at the map to make sure they choose sites in a variety of locations. They can use the site table to help choose sites at different elevations. Encourage them to choose at least one site in an urban area.

7. Have your students fill out the rest of the chart and answer the discussion questions on page 5.
<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Water Features</th>
<th>Urban/suburban</th>
<th>Elevation (m)</th>
<th>Long.</th>
<th>Lat.</th>
<th>Location</th>
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Wrap-Up/Discussion
Students should have filled the following categories on their comparison charts:

- Site name from PhenoCam gallery
- Location- state, country
- Latitude
- Longitude
- Elevation in meters
- Terrain- flat, hilly, mountainous
- Urban- city; suburban- some houses, small town; rural- few houses, farms, open space
- Water- streams, rivers, ponds, ocean
- Vegetation- forest (deciduous, conifer, mixed), shrubs, grassland, cropland

After completing their charts, time can be taken at the end of the lesson for students to share some of the sites they found. This could be done on an interactive whiteboard or projector. Questions should be discussed as a group. This lesson can be an introduction to a lesson on how the PhenoCam computer image analysis generates and graphs the green chromatic coordinates.

Potential Discussion Questions

- Describe three of the sites you chose. Why did you choose these particular sites? How are they alike? Different?
- How might location, temperature, precipitation, elevation, and urban development affect the timing of plant phenophases?
- What effect will climate change have on plant phenology?
- How do you think these phenological changes affect ecosystem processes such as the carbon cycle, nutrient cycles, water, and food webs?