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 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

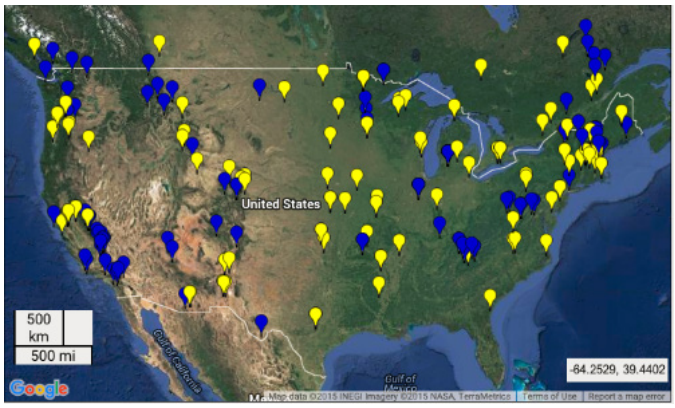
Learning Outcomes

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.



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

Activity Instructions

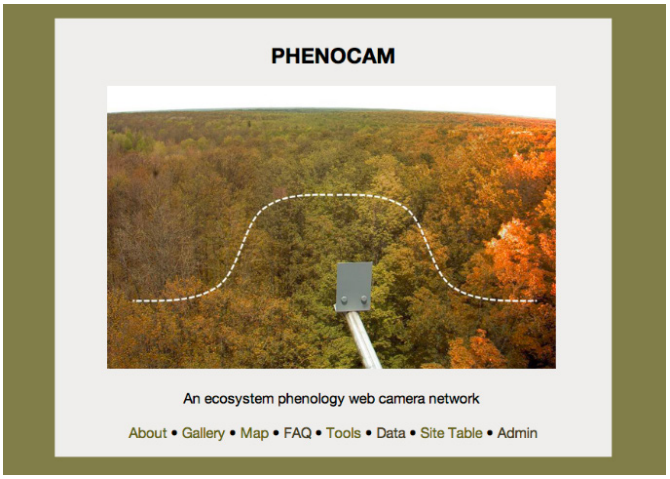
Task 1: Introduce PhenoCam

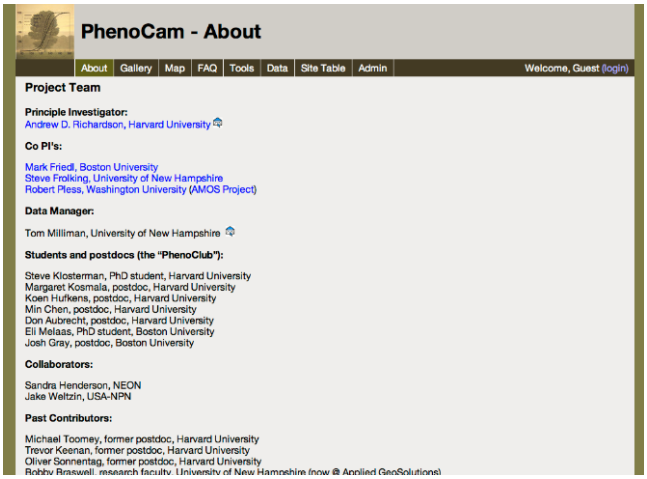
1. Activity Introduction.

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.

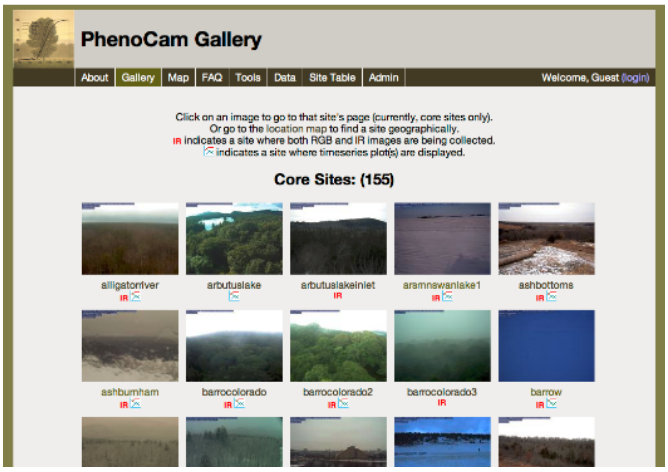
Open the PhenoCam website. http://PhenoCam.sr.unh.edu/webcam/. Go to the "About" tab and give the students some time to read about the PhenoCam project.

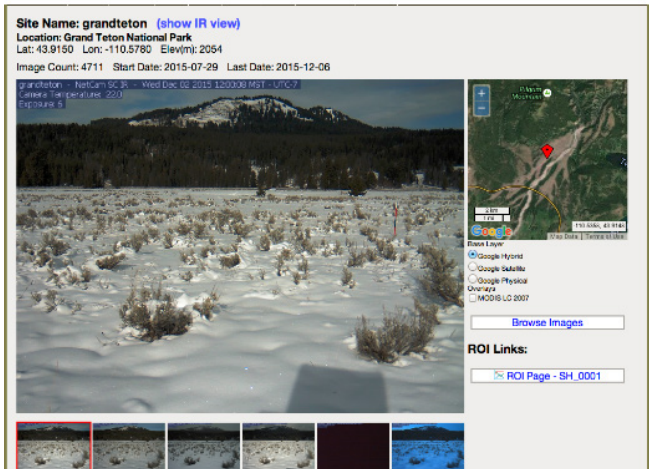




3. Navigate to the Photo Gallery.

Demonstrate how to open the photo gallery by clickling 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.

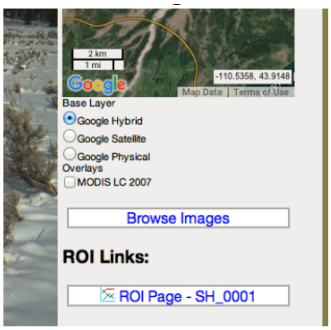


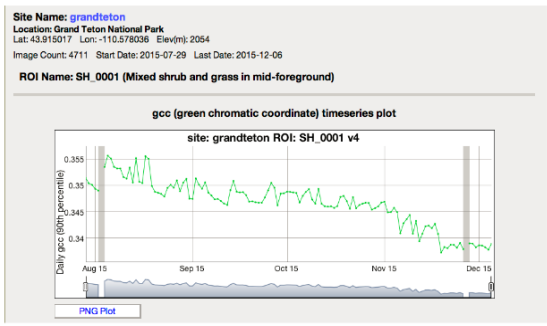


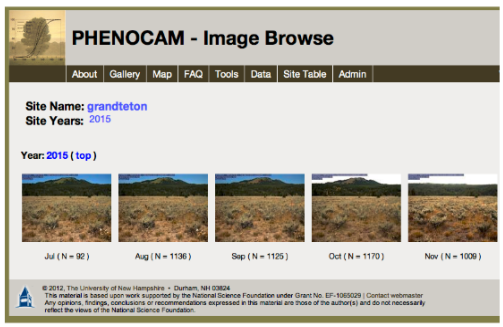
Task 1: Introduce PhenoCam (continued)

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.





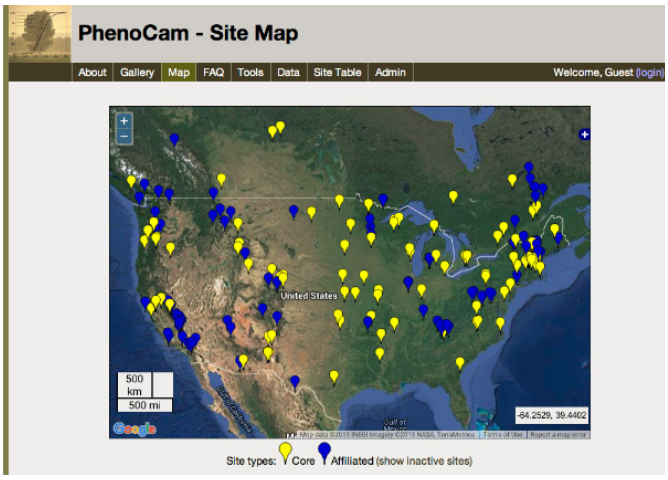


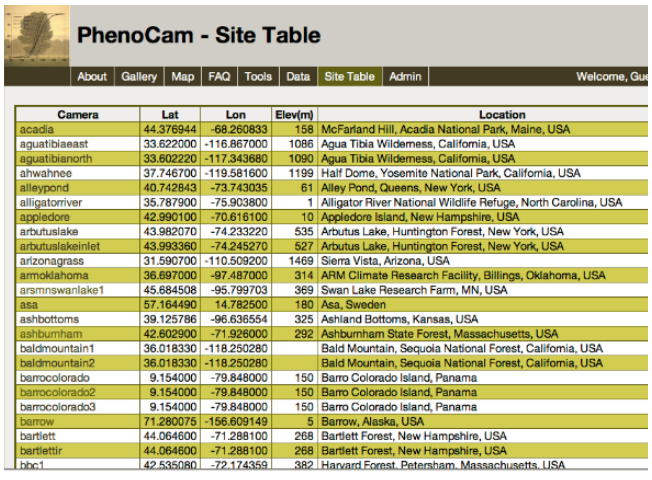
Task 2: Complete the Site Comparison Chart

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.





Camera	Lat	Lon	Elev(m)	Location
acadia	44.376944	-68.260833	158	McFarland Hill, Acadia National Park, Maine, USA
aguatibiaeast	33.622000	-116.867000	1086	Agua Tibia Wilderness, California, USA
aguatibianorth	33.602220	-117.343680	1090	Agua Tibia Wilderness, California, USA
ahwahnee	37.746700	-119.581600	1199	Half Dome, Yosemite National Park, California, USA
alleypond	40.742843	-73.743035	61	Alley Pond, Queens, New York, USA
alligatorriver	35.787900	-75.903800	1	Alligator River National Wildlife Refuge, North Carolina, USA
appledore	42.990100	-70.616100	10	Appledore Island, New Hampshire, USA
arbutuslake	43.982070	-74.233220	535	Arbutus Lake, Huntington Forest, New York, USA
arbutuslakeinlet	43.993360	-74.245270	527	Arbutus Lake, Huntington Forest, New York, USA
arizonagrass	31.590700	-110.509200	1469	Sierra Vista, Arizona, USA
armoklahoma	36.697000	-97.487000	314	ARM Climate Research Facility, Billings, Oklahoma, USA
arsmnswanlake1	45.684508	-95.799703	369	Swan Lake Research Farm, MN, USA
asa	57.164490	14.782500	180	Asa, Sweden
ashbottoms	39.125786	-96.636554	325	Ashland Bottoms, Kansas, USA
ashburnham	42.602900	-71.926000	292	Ashburnham State Forest, Massachusetts, USA
baldmountain1	36.018330	-118.250280		Bald Mountain, Sequoia National Forest, California, USA
baldmountain2	36.018330	-118.250280		Bald Mountain, Sequoia National Forest, California, USA
barrocolorado	9.154000	-79.848000	150	Barro Colorado Island, Panama
barrocolorado2	9.154000	-79.848000	150	Barro Colorado Island, Panama
barrocolorado3	9.154000	-79.848000	150	Barro Colorado Island, Panama
barrow	71.280075	-156.609149	5	Barrow, Alaska, USA
bartlett	44.064600	-71.288100	268	Bartlett Forest, New Hampshire, USA
bartlettir	44.064600	-71.288100	268	Bartlett Forest, New Hampshire, USA
bbc1	42.535080	-72.174359	382	Harvard Forest, Petersham, Massachusetts, USA

7. Have your students fill out the rest of the chart and answer the discussion questions on page 5.

Exploring the PhenoCam Locations

Name:

Site name	Location	Lat.	Long.	Elevation (m)	Terrain-	Urban/suburban /rural	Water Features	Vegetation

http://phenocam.sr.unh.edu/

SEASON SPOTTER

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

Afte 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?