

Phenology and Student Scientists



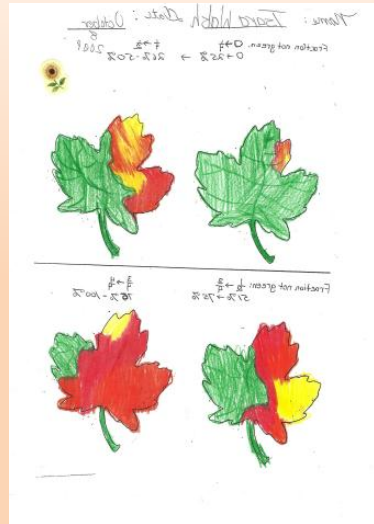
Katherine Bennett

JR Briggs Elementary School
Ashburnham- Westminster
Regional School District



Phenology is the study of recurring lifecycle events influenced by seasonal environmental changes, and classic examples include flowering by plants and migration by animals.

Is our growing season changing in relation to climate change?



Harvard Forest LTER Schoolyard Program
Bark, Leaves and Global Warming

Student Data Sheet - Spring
www.harvardforests.org

Name: _____ Date: _____
School: _____
Tree Species: _____ Branch Letter: _____
Tree ID: _____

1. Put a check mark in the correct column below to show the stage of each leaf.

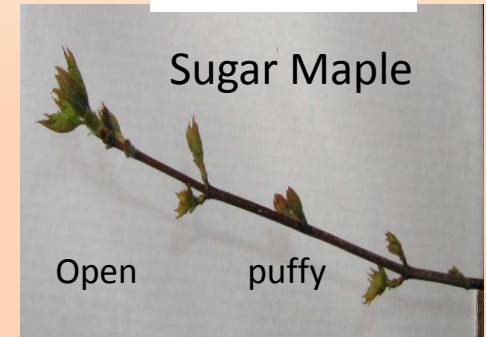
	Leaf 1	Leaf 2	Leaf 3	Leaf 4	Leaf 5	Leaf 6
Check that a closed bud is present.						
Check that a closed bud is present.						
Check that a closed bud is present.						
Check that a closed bud is present.						
Check that a closed bud is present.						

2. How many buds were observed in all? Of these, how many were closed? _____ Puffy? _____ Open? _____

3. Look for the open bud with the largest leaf. Measure the leaf length to the nearest _____.

4. Field notes:
Temperature (degrees Celsius): _____
Humidity (%): _____
Cloud cover: _____ Windy: _____ Rain: _____
Other observations and notes: _____

Teacher Note: Please combine any data of branches on the same tree to make two data sets for submission to Harvard Forest.



Harvard Forest Schoolyard Ecology
Bark, Leaves, and Global Warming

Autumn Student Data Sheet December 2007

Name: _____ Date: _____
Teacher: _____ School: _____

Tree Number: _____ Branch letter: _____ (Please identify letter only, name of tree is optional)

Tree Species: _____

Leaf Length (cm): _____ Leaf 1 _____ Leaf 2 _____ Leaf 3 _____ Leaf 4 _____ Leaf 5 _____ Leaf 6 _____

Leaf Width (cm): _____

Put a check mark in the correct column below to show Leaf Color and Leaf Drop

Leaf #	Fraction Percent of Leaf Color (not green)	Leaf Drop			
	0-25%	26-50%	51-75%	76-100%	Leaf Fallen
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Whole Tree					N/A

Total number of study leaves observed per branch (Green and not fallen): _____
Total number of leaves fallen: _____

Teacher note: Remember that the branch total above must be added with branch totals from all branches on the same tree to get the total number of leaves dropped per tree to submit to Harvard Forest to post online.

Optional Field Notes: _____
Weather Notes: _____ Animal Flight notes: _____

Firefox - Harvard LTER Schoolyard Program

http://harvardforest.fas.harvard.edu/museum/data/sy001/sy001.html

Home Insert Page Layout Formulas Data Review View

Calibri 11

	A	B	C	D	E	F	G	H	I
	School	Teacher	Date	Julian	TreeID	Species	Ltotal	Lfallen	Tcolor
1	JRB	Bennett	9/22/2008	266	21	RO	4	0	1
2	JRB	Bennett	9/22/2008	266	22	RO	4	0	1
3	JRB	Bennett	9/22/2008	266	23	BB	12	0	1
4	JRB	Bennett	9/22/2008	266	24	TA	11	1	1
5	JRB	Bennett	9/22/2008	266	25	GB	9	1	1
6	JRB	Bennett	9/22/2008	266	26	RM	12	0	1
7	JRB	Bennett	9/29/2008	273	21	RO	4	0	1
8	JRB	Bennett	9/29/2008	273	22	RO	4	0	2
9	JRB	Bennett	9/29/2008	273	23	BB	12	0	1
10	JRB	Bennett	9/29/2008	273	24	TA	11	1	1
11	JRB	Bennett	9/29/2008	273	25	GB	9	1	1
12	JRB	Bennett	9/29/2008	273	26	RM	12	0	1
13	JRB	Bennett	10/6/2008	280	21	RO	4	0	3
14	JRB	Bennett	10/6/2008	280	22	RO	4	0	4
15	JRB	Bennett	10/6/2008	280	23	BB	12	2	1
16	JRB	Bennett	10/6/2008	280	24	TA	11	2	2
17	JRB	Bennett	10/6/2008	280	25	GB	9	1	2
18	JRB	Bennett	10/6/2008	280	26	RM	12	0	2
19	JRB	Bennett	10/6/2008	280	27	RO	4	0	2

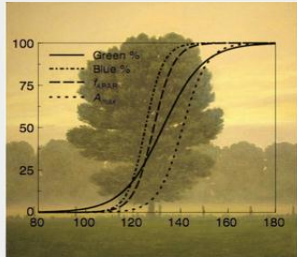
Ready

Joining the PhenoCam Network

Gmail - Inbox (1,612) - kbenn... Phenocam

phenocam.unh.edu/webcam/

PHENOCAM



An ecosystem phenology web camera network

Gallery • Map • Data • About • Links • Table • Inventory • Summary

Gmail - Inbox (1,612) - kbenn... PHENOCAM

phenocam.unh.edu/webcam/gallery/






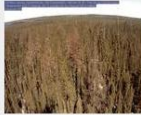









PhenoCam Gallery

Home Gallery Map Data Links About

Welcome, Guest (login)

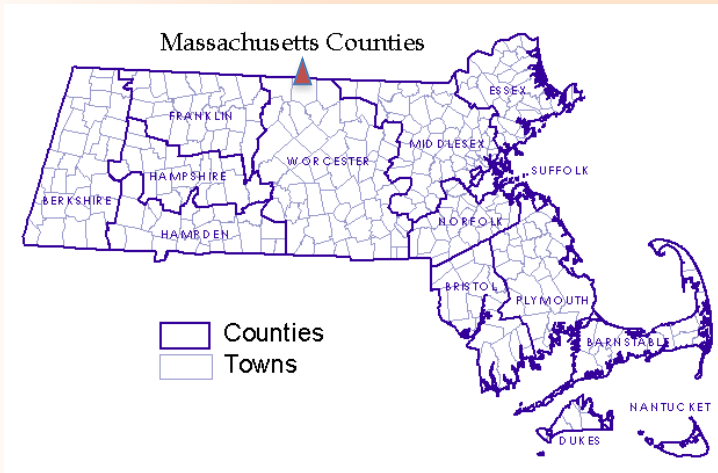
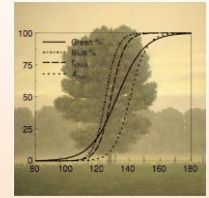
Click on an image to go to that site's page (currently, core sites only).
Or go to the location map to find a site geographically.
The * indicates a site where both RGB and IR images are being collected.

Core Sites:

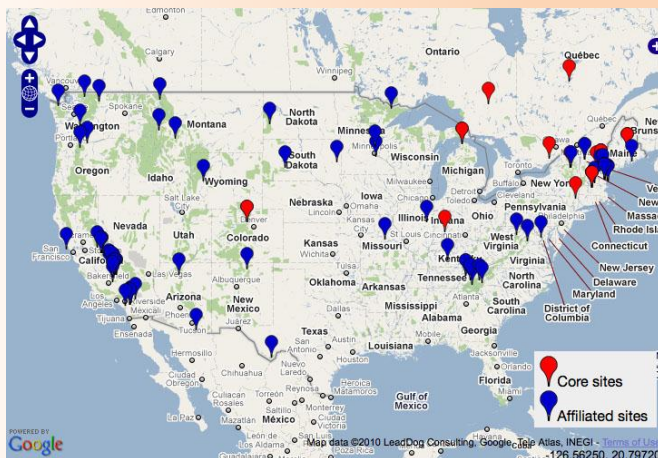
 arbutuslake	 ashburnham*	 bartlett	 bartlettir*	 canadaOA*
 canadaOBS*	 caryinstitute	 coveeta	 freemangrass*	 groundhog
 harvard	 harvardbarn*	 harvardbarn2*	 harvardblo	 harvardhemlock



Joining the Phenocam Network



Overlook Middle School





John R. Briggs ELEMENTARY SCHOOL



DIRECTORY

PARENTS

STUDENTS

STAFF

LIBRARY

LOGIN

Username:

Password:

LOGIN

[Forgot Password?](#)

[Need Help?](#)

[English](#) | [Español](#)

District Announcements



Parent Survey Request

Each year, in response to federal special education requirements, the Department of Elementary and Secondary Education (DESE) works with a cohort of school districts in the Commonwealth to survey all parents, not just parents of children with special needs, about parent involvement. AWRSD has been selected by the Department to participate in this survey.

To access this survey, please go to <http://www.MAparent2.com>. The entire process takes between three and ten minutes. Thank you in advance for providing this valuable information.

Briggs News

PHENOCAM Project Update



Check out the latest images from the Briggs Phenocam—the forest canopy is budding out early this year, due to the warm weather. For those of you who aren't familiar with the project, fifth grade teacher Katie Bennett has made Briggs Elementary part of the national PHENOCAM project. Mrs. Bennett will be working with scientists at Harvard Forest to analyze data from the Briggs PHENOCAM (temporarily located at Overlook Middle School until after construction of the new building is completed). Scientists are studying how the forest canopy in our area is changing, in particular the timing of color change in the fall and budburst in the spring. [Click here to check out the view!](#)

[2012 Kindergarten Registration & Orientation](#)

UPCOMING EVENTS

» Tuesday, April 10

SCHOOL COMMITTEE

Budget Sub. Meeting

• 6:30 PM
OMS Library

SCHOOL COMMITTEE

School Committee Meeting

• 7:00 PM

» Thursday, April 12

JRB EVENT

PTA Meeting

• 4:30 PM - 6:00 PM
in the JRB library
"New time!"

» Monday, April 16

April Vacation

No School

» Tuesday, April 17

April Vacation

No School

Tuesday, April 10, 2012
[View Monthly Calendar](#)

The spring phenology signal derived from the webcam images at BEF compared favorably with that derived from conventional radiometric measurements, such as f_{APAR} (the fraction of incident photosynthetically active radiation absorbed by the canopy), or broadband NDVI (a Normalized Difference Vegetation Index calculated from albedos of visible and global shortwave radiation). Springtime increases in the light-saturated rate of canopy photosynthesis, A_{max} , tended to lag changes in canopy green-up.

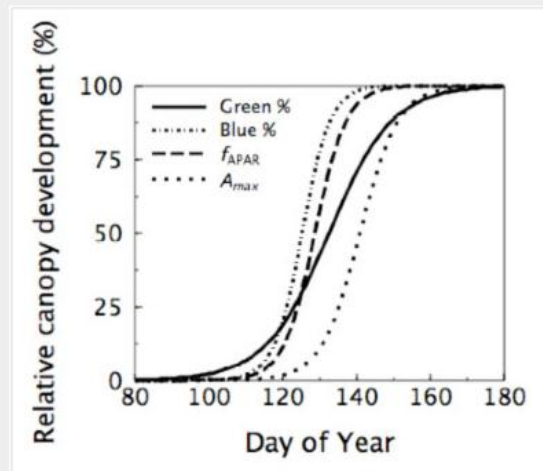


Figure 2. Comparison between green-up signal derived from relative green and blue (green%, blue%) webcam channel brightnesses, compared to f_{APAR} (the fraction of incident photosynthetically active radiation absorbed by the canopy, measured with radiometric instruments) and A_{max} (the light-saturated rate of canopy photosynthesis, as estimated from eddy flux measurements of CO_2 exchange). Source: Richardson et al. (2007).

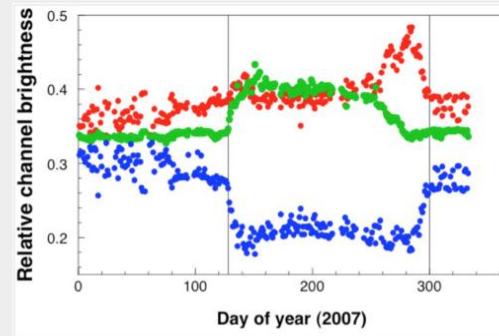
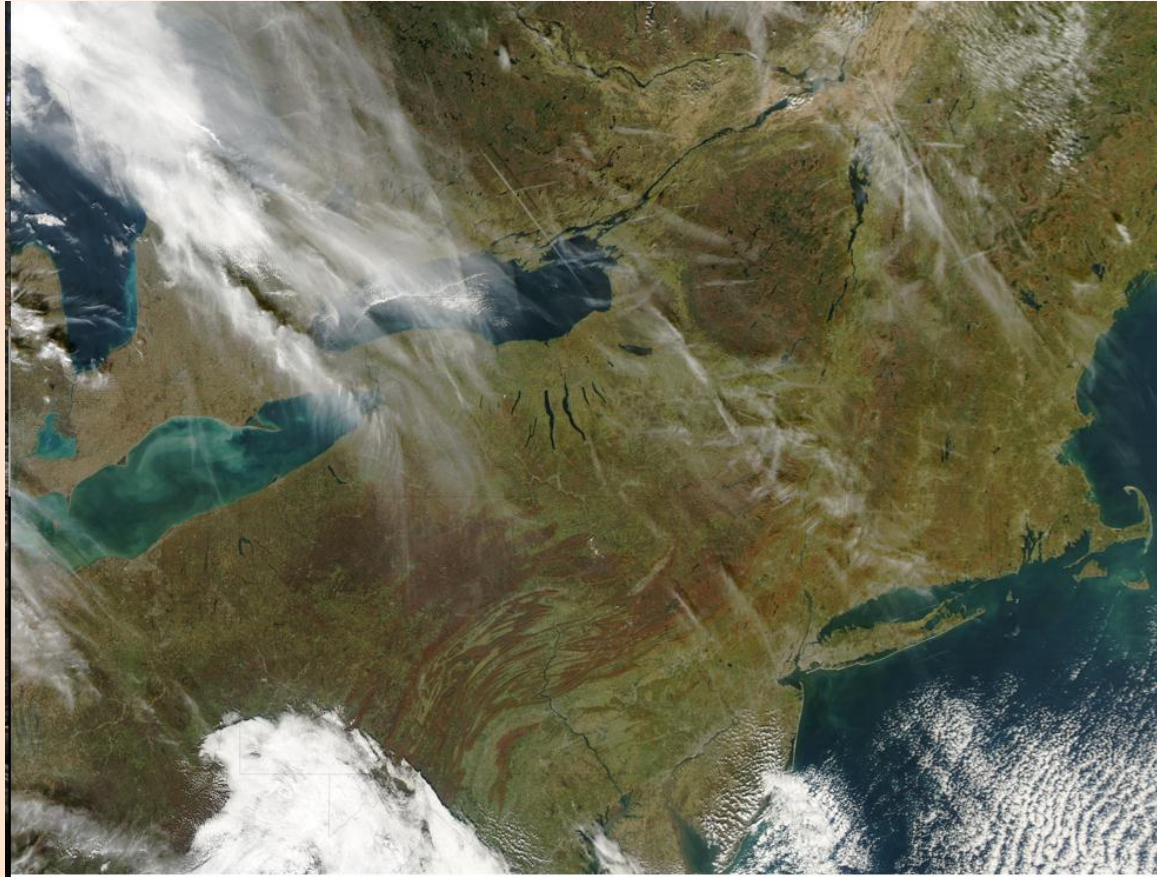


Figure 1. (Top) Sample webcam image from the Bartlett Experimental Forest. (Bottom) Seasonal trajectory of canopy phenology as derived from the webcam images. Shown is relative brightness (%) of the red, green and blue color channels, across the calendar year. Green% begins a rising trend around day 128 (early May), corresponding to leaf out, and levels off around day 160 (mid June), when the canopy is fully developed. The onset of autumn coloration begins by day 220 (mid August). By day 270 (late September), Green% has reached the dormant season minimum—although at this point in time, leaves have not yet fallen. The spike in Red% at day 270 corresponds to peak autumn coloration. The decrease in Red % over the next 30 days (through day 300) occurs as senescence progresses and the deciduous canopy is shed.



Nasa's MODIS satellite pictures to determine the dates of phenoevents such as leaf drop and budburst.

Compare ground data to the canopy



Harvard Forest Schoolyard Ecology
Buds, Leaves, and Global Warming

Autumn Student Data Sheet

December 2007

Name: _____ Date: _____
Teacher: _____ School: _____

Tree Number: _____ Branch letter: _____
Tree Species: _____ Please measure leaves only once at beginning of season.

	Leaf 1	Leaf 2	Leaf 3	Leaf 4	Leaf 5	Leaf 6
Leaf Length (cm.)						
Leaf Width (cm.)						

Put a check mark in the correct column below to show Leaf Color and Leaf Drop

Leaf #	Fraction/ Percent of Leaf Color (not green)				Leaf Drop 0-not fallen 1- fallen
	0 - 25%	26 - 50%	51 - 75%	76 - 100%	
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Whole Tree					N/A

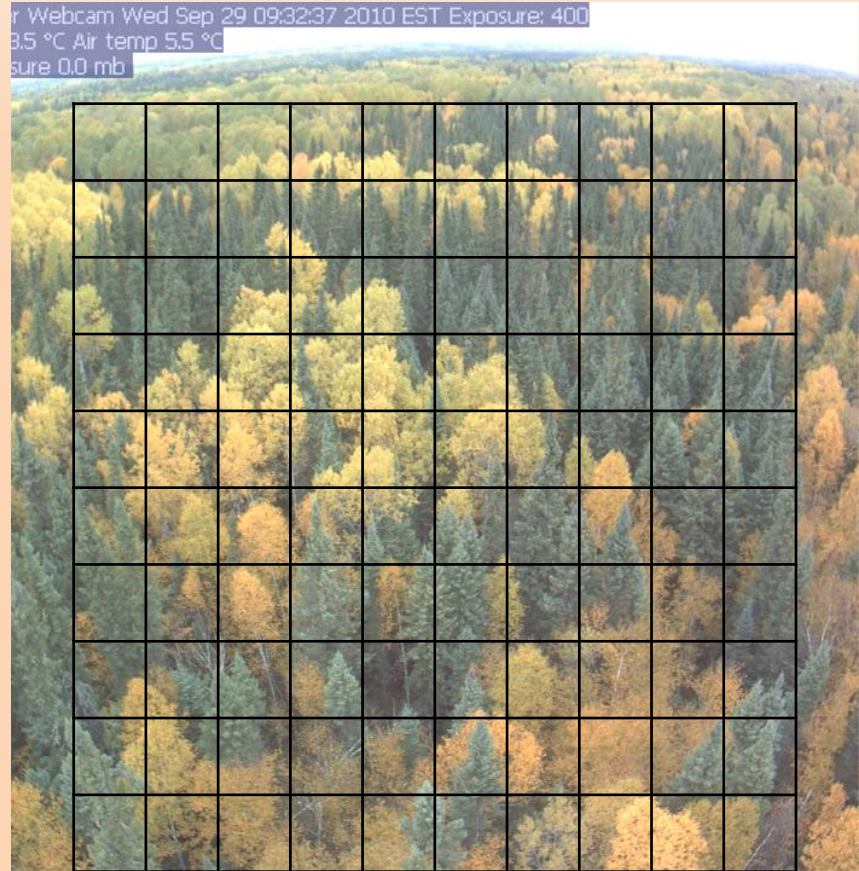
Total number of study leaves observed per branch (fallen and not fallen) _____
Total number of leaves fallen _____

Teacher note: Remember that the branch total above must be added with branch totals from all branches on the same tree to get the total number of leaves dropped per tree to submit to Harvard Forest to post online.

Optional Field Notes:

Weather Notes:

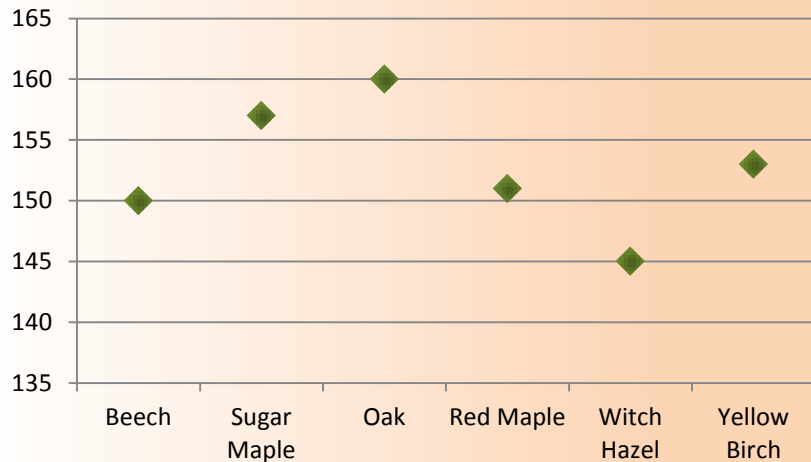
Animal/ Plant notes:



Do the dates of the pheno events vary among species?

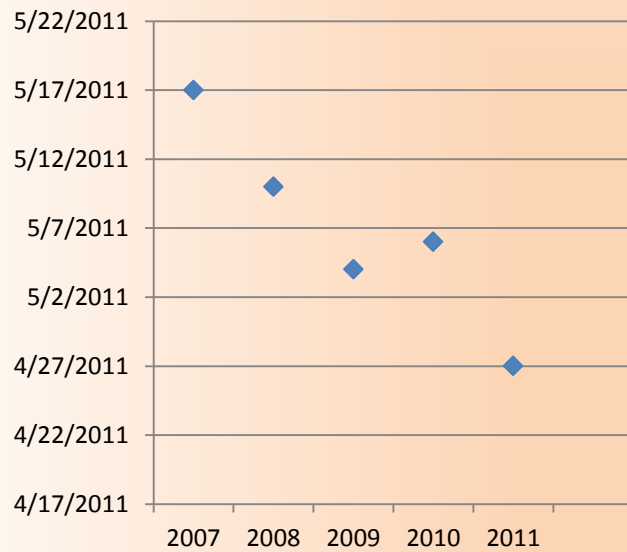
Can we use those differences to determine the dominant tree species?

Budburst Julian day

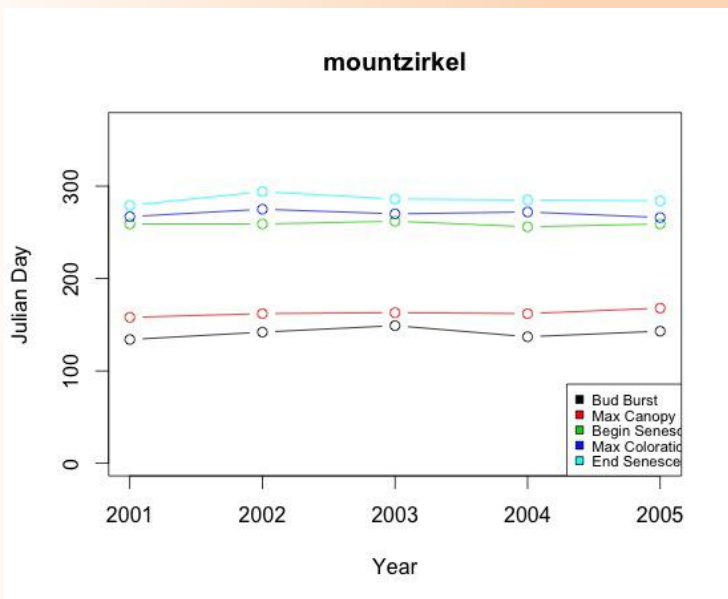


Are the dates of the pheno events different each year?

Average date bud burst



Comparing sites near and far away



Fifth Grade Pheno Events

September 1



March 1



May 15



Massachusetts Comprehensive Assessment System

