Harvard LTER Schoolyard Program

Teacher Developed Lessons and Documents that integrate Harvard Forest Schoolyard Ecology Themes into curriculum.

Title: Going all the Way! Putting Five Years of Data into a Story

Project: Buds, Leaves and Global Warming

Teacher: Lise Letellier

School: Holyoke Catholic High School

Level: High School

Date: March 31, 2016

Going all the way!

Finally putting the years of data into a story

Harvard LTER Schoolyard Buds and Leaves.

A 5 year journey.

NGSS- Science Practices

- Asking Questions
- Planning and carrying out investigations
- Analyzing and interpreting data

- Constructing explanations
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information

It all began....

The first year (2011-2012) was filled with:

Too many trees.... 26

Too many visits....10-12 (each fall and spring)

Too many mistakes... (let's not go there!)

Too much fun :) :)
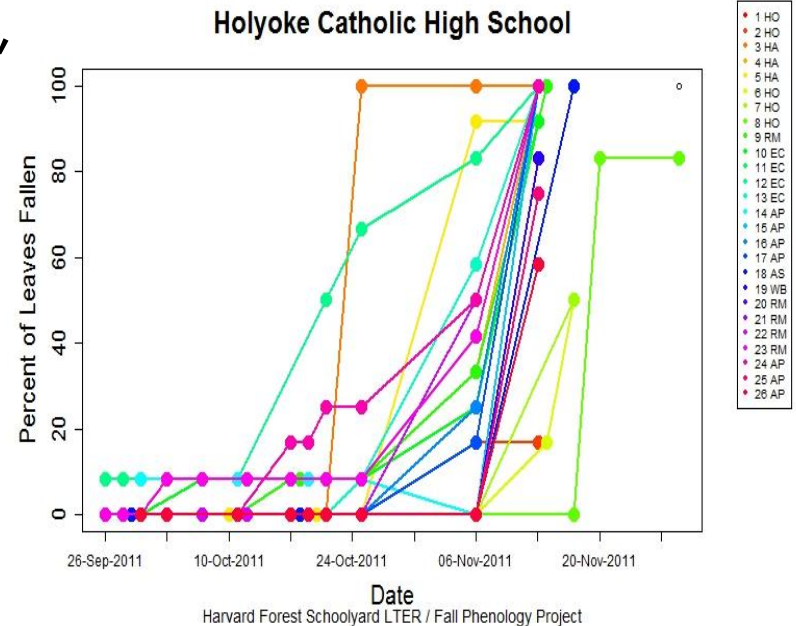
First Year 2011-2012

Fall data:
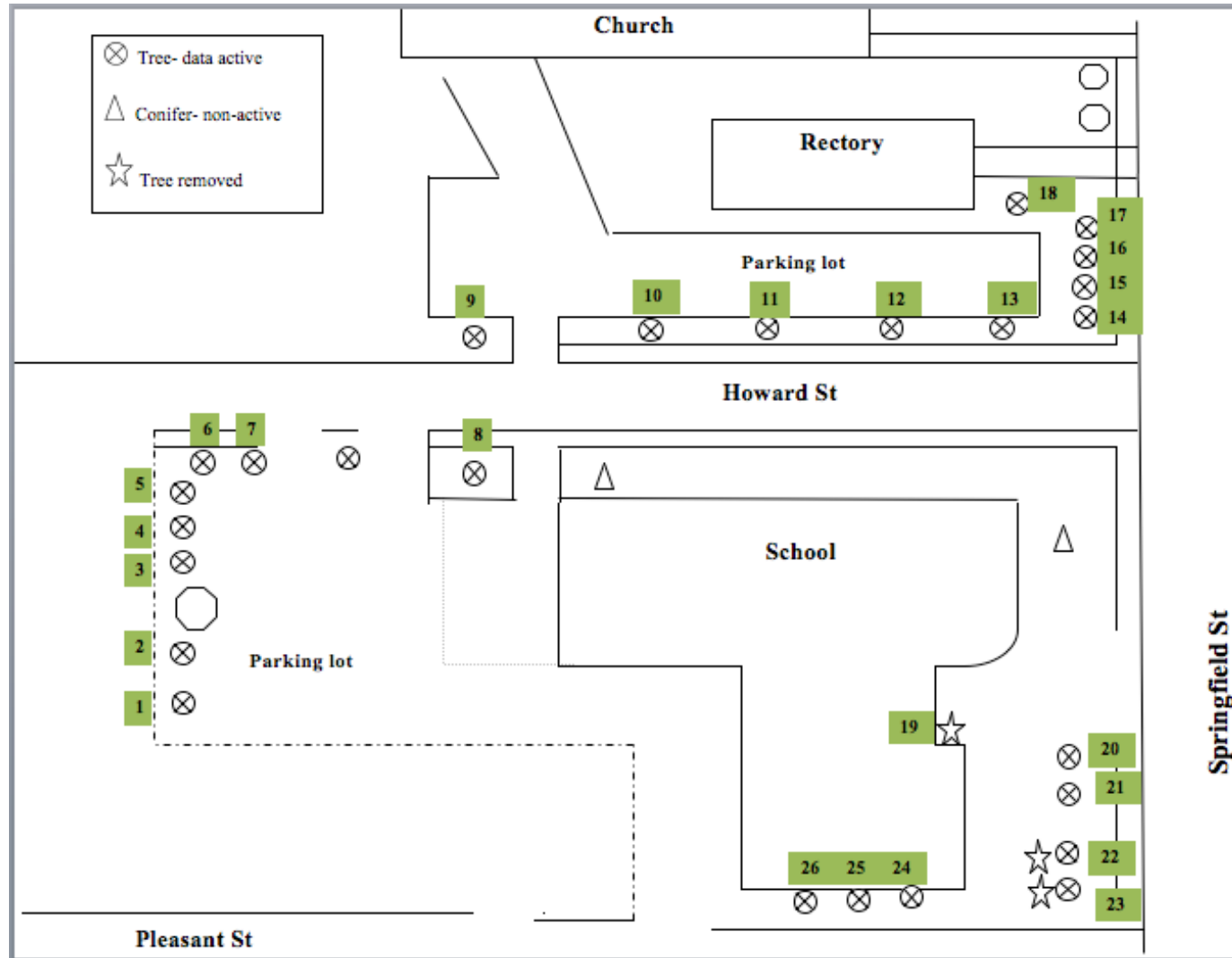   Collected, uploaded, viewed, and did basic analysis.

Spring Data-
    Collected and uploaded. Students did not get to view

Holyoke Catholic High School

Harvard Forest Schoolyard LTER / Fall Phenology Project

Second Year-Plot-Who goes where?

Second year (2012-13) .... Smooth sailing right? Not

A few less trees- 18,
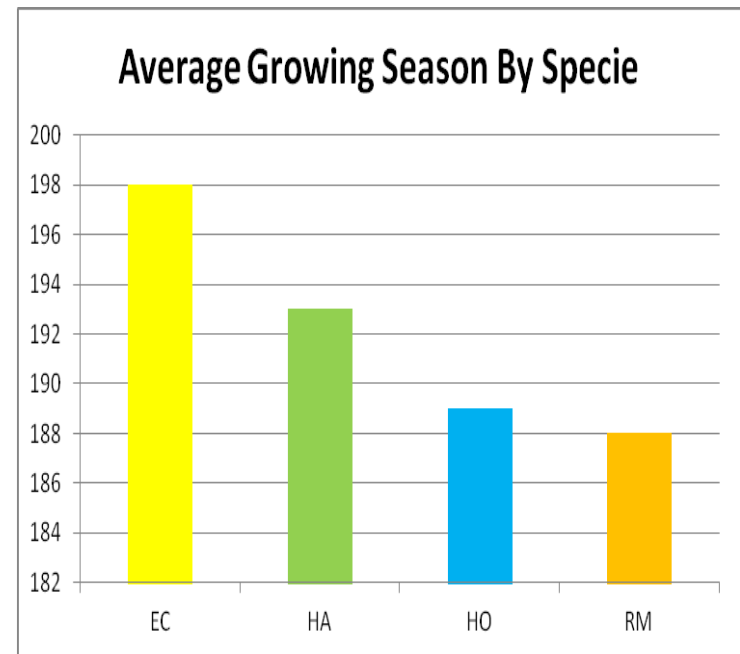Some by choice some by nature

A few less mistakes- 11 trees done completely right
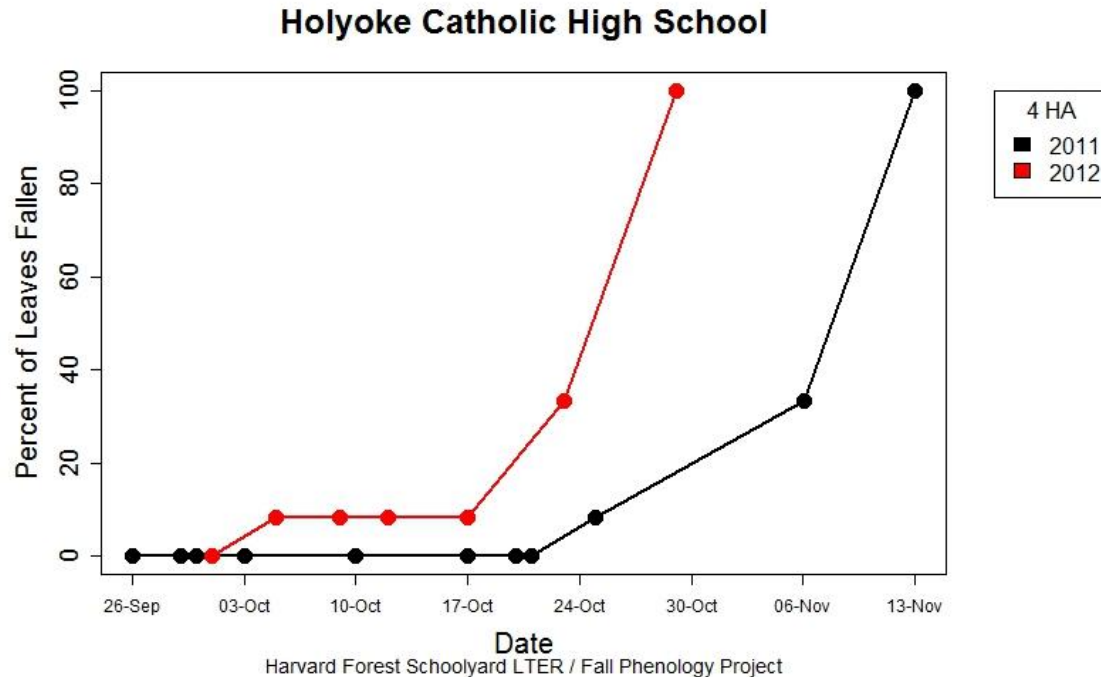
The first opportunity to compare data.
Fall 2011 and Fall 2012
Lots of excitement by students

It was pretty exciting.

Average Growing Season By Specie

Ashley- CP level- IEP

Holyoke Catholic High School

Percent of Leaves Fallen vs Date

4 HA
■ 2011
■ 2012

Harvard Forest Schoolyard LTER / Fall Phenology Project

- Compared 2 seasons of fall data (2011 & 2012)
- Wrote a conclusion paragraph based on graphs
- Modification from standard conclusion format:
  - Purpose, major findings, hypothesis, comparison, expectations, recommendations, further study.
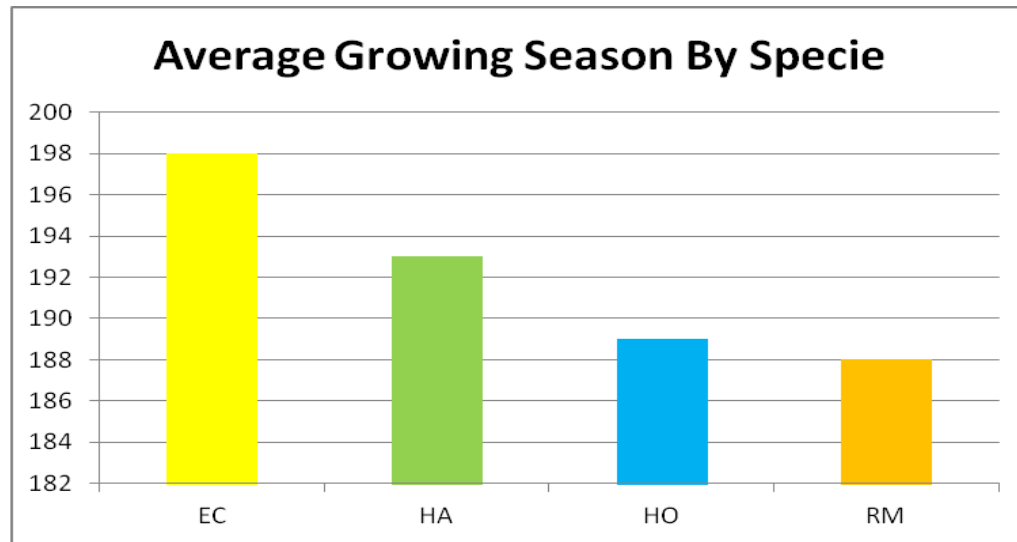
The purpose of The Harvard Forest Tree study was to find out if the leaves falling in 2012 were earlier or later then the leaves in 2011 and also the same thing with the leaves changing color. **The major findings were that in 2012 the leaves fell earlier then the leaves in 2011. The leaves in 2011 started falling around day 295 and 2012 started falling around day 275.** The major findings for the color of the trees were that in 2011 the tree color lasted later then in 2012 because 2011 started changing at day 300 and 2012 started changing in day 275. **In comparison to the other classmates graphs their leaves fell and also changed color later in 2011.** I did not expect tree number 4 to be different from everyone else's, but I am now thinking that I only checked with the classmates who had their tree on the opposite side then mine. In conclusion, the reason for the different ways all the trees have fallen or changed faster or slower could've been because of where your tree was or also because of the weather or also the leap year that happened in 2012.

Honors students Calculated 2012 Growing Season- First Me, then…….

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1					Comparison of Growing season for HCHS urban trees											
2	Tree & Species Code	Julian date of 50% budsburst			Tree & Species Code	Julian date of 50% leaf fall			Tree & Species Code	Average growing season length by tree			Average growing season by specie			
3		2012	2013	2014		2012	2013	2014		2012	2013	2014		2012	2013	2014
4	AP-15	/	106	111	AP-15	324	314	/	AP-15	/			AP	/		
5	AP-17	/	106	125	AP-17	304	314	316	AP-17	/			AS	/		
6	AS-18	/	127	135	AS-18	/	323	323	AS-18	/			EC	198		
7	EC-10	94	106	129	EC-10	307	279	/	EC-10	213			HA	193		
8	EC-12	97	106	119	EC-12	294	298	/	EC-12	197			HO	197		
9	EC-13	100	106	/	EC-13	283	289	/	EC-13	183			RM	188		
10	HA-3	110	118	104	HA-3	299	297	300	HA-3	189						
11	HA-5	101	121	122	HA-5	299	306	/	HA-5	198			EC-	Exotic Cherry		
12	HO-7	146	109	126	HO-7	321	323	324	HO-7	175			HA	Hawthorn		
13	HO-8	109	114	126	HO-8	326	322	336	HO-8	217			HO-	Hornbeam		
14	RM-9	109	115	120	RM-9	301	306	297	RM-9	192			RM	Red Maple		
15	RM-20	114	118	122	RM-20	299	305	305	RM-20	185			AP	Apple		
16	RM-21	110	116	127	RM-21	298	294	/	RM-21	188			AS	American Sycamore		
17																
18	**DIRECTIONS**															
19	1) Write a prediction as to how the growing season for 2014 compares to the other years. It can be general or specific based on a specie.															
20	2) Determine growing seasons length (2013 &14) by tree using excel to calculate following directions below or do by hand.															
21	Excel: Click on cell. Enter formula starting with −;click on date of 50% leaf fall; hit the minus key(-); click on 50 budbust; hit enter															
22	Keep number in a whole number by click on the .o .oo key															
23	3) Calculate average growing season by specie for 2014															
24	4) Cut and paste data tables into a word document															
25	5) Make 4 graphs, comparing the 3 years, then cut and paste into the word document															
26	To make graphs, select the cells in the tree ID and year columns (highlights a square), select Insert; choose column or bar graph.															
27	Julian date of 50% budsburst															
28	Julian date of 50% leaf fall															
29	Average growing season length by tree															
30	Average growing season by specie															
31	6) Write a result statement for each graph															
32	7) Write a conclusion paragraph															

Kacie-Honors

Average Growing Season By Specie

Result Statement: The tree species that has the longest growing season is the Exotic Cherry. The Hawthorn has the second longest growing season and the Hornbeam has the third longest growing season. The tree species with the shortest growing season is the Red Maple.

Two years, high goals

2013-2014

- Goal: Collect data and calculate growing seasons and compare.
- Achieved: all collected, no one calculated and compared Buds data.
- I started HWA and ran out of time.

2014-2015

- Goal: Honors Collected, calculated, compared;
- Achieved all for honors using the excel spreadsheet.

This year 2015/2016…..
Success all round

- All level students collected
- All level students compared, one or more trees
- All level students succeeded

- All students used four HF Schoolyard graphs to compare and analyze.
- Most students(90%) continued on to download 50% data and calculated growing seasons and compared.
- See directions in handout.
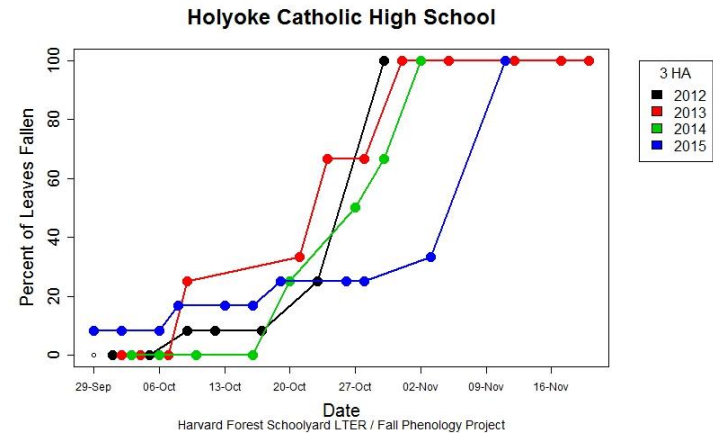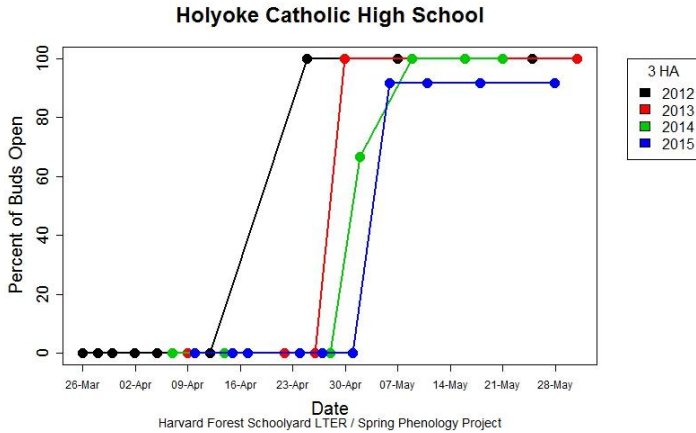
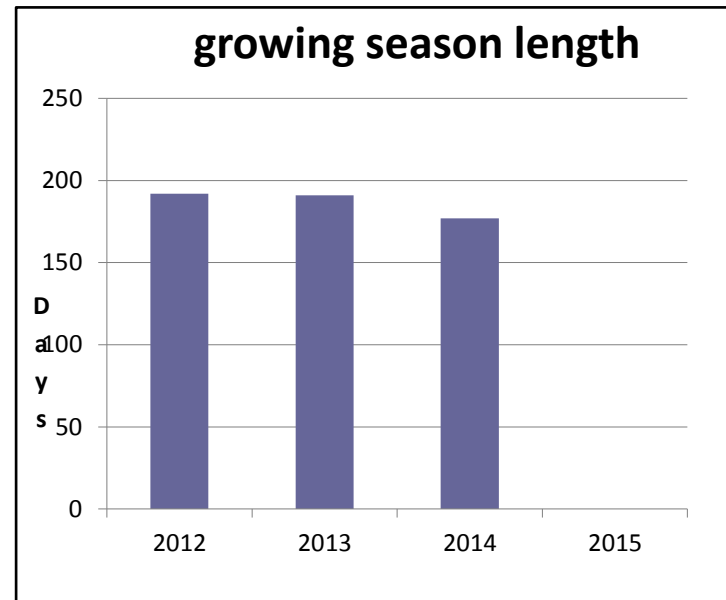**Results Statement:**

As the tree's percent of buds open was recorded in the spring over the past four years, the percent of buds open increased later each year except for in 2013. In 2012, the buds were open 100% around April 23. In 2013, the buds were open 100% around April 26. In 2014, the buds were open 100% around May 8. In 2015, the buds were open the most around May 6.
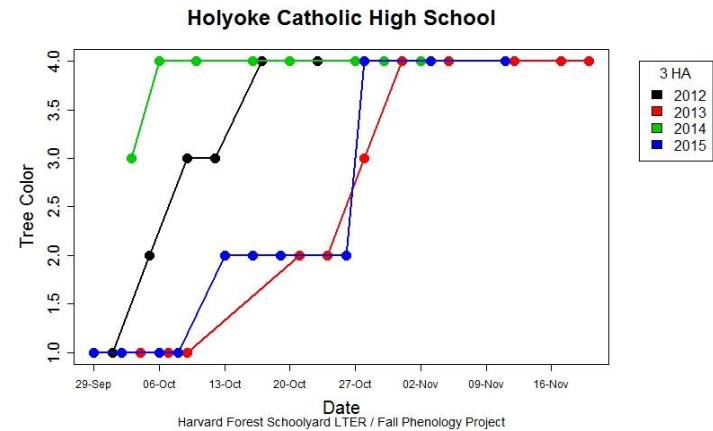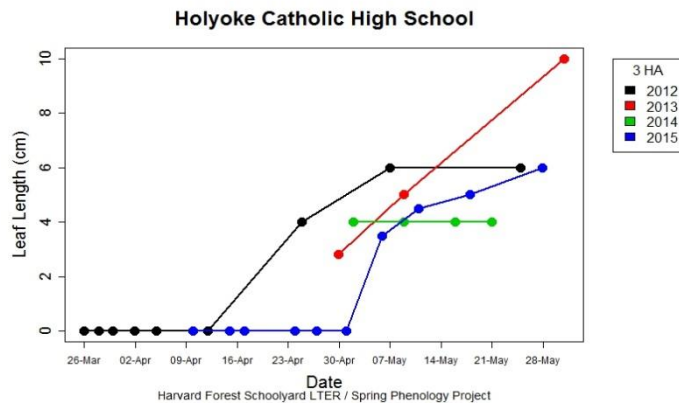
All students, all levels, success

- KOK– Severe LD
- Normal class success rate- 50-60%
- For 4-5 days-Focused
- Independent
- All analysis accurate.

growing season length

A bar chart titled "growing season length" with y-axis labeled "Days" ranging from 0 to 250. Years 2012, 2013, 2014, 2015 on the x-axis. Bars: 2012 ≈ 192, 2013 ≈ 191, 2014 ≈ 177, 2015 no bar.

This data shows that the growing season lengths have very slight differences over the years but are still getting shorter. The growing season lengths of 2012 and 2013 are nearly identical but in 2014 it is a bit shorter than the other years by about ten to twenty days. I am guessing that the growing seasons will slightly get shorter as the years go on.

R.S- Highest Average Honors Student

AP 17 Growing season Length
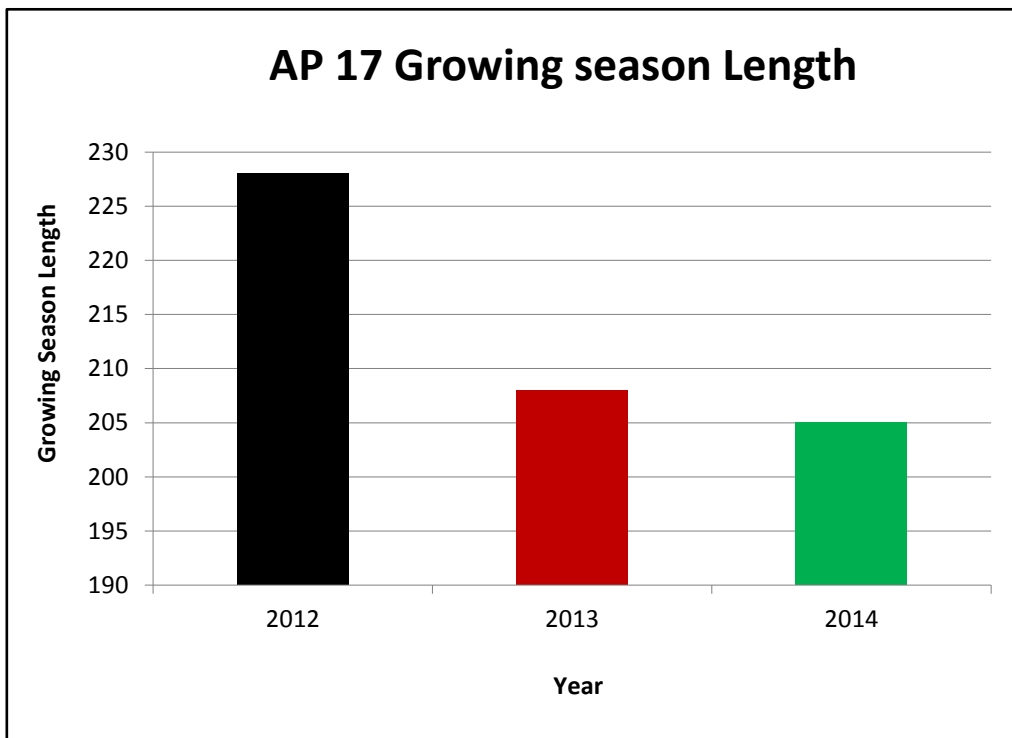
The longest growing season for apple tree #17 was 2012, which was equal or greater than 228 days. 2014 had the shortest growing season with 205 days and the 2013 growing season was slightly longer than 2014 with208 days.

Other students compared multiple trees or multiple years

Growing season length HA-3 and HA-4
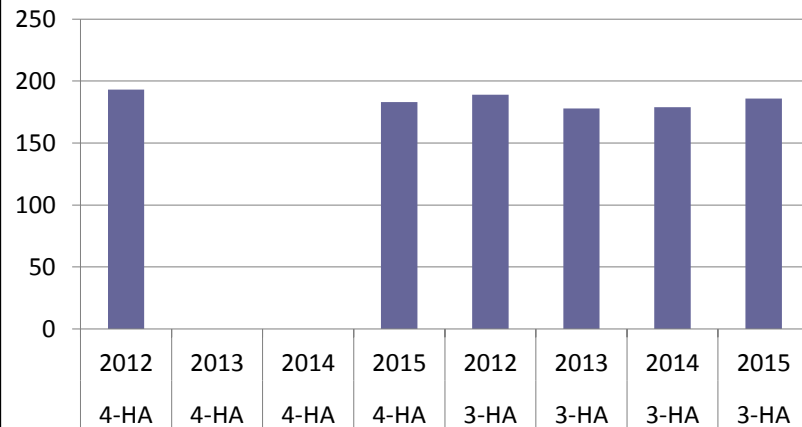
Growing Season Length
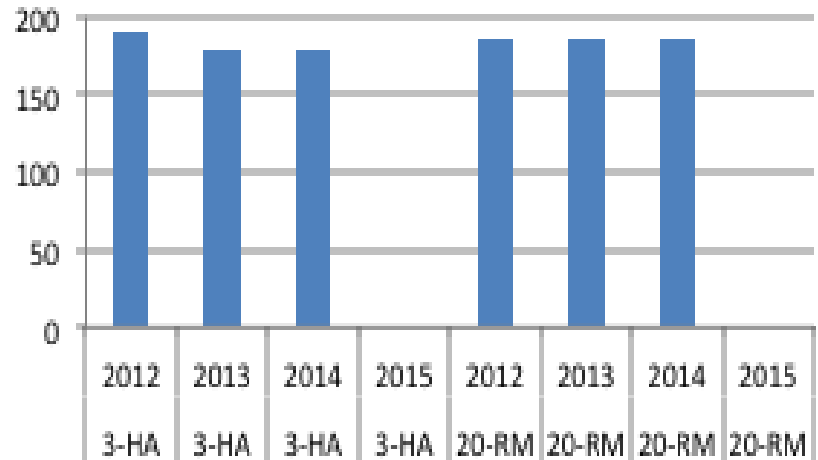
On all levels- Success.

Time to analyze and produce reports-
    5 days- 45 minute/day.

Best 5 days I ever spent!

TIMELINE

Buds and Leaves
By: Lise LeTellier

August 2011
I get trained

Spring 2012 Workshop
I get trained again

2012/13
Workshop-I learn how to calculate Growing season

Feb 2013
Honor's Students calculate 1st growing season

Mentoring 2013

Mentoring 2014

:(2014
Did not calculate Growing season

:) 2015
Honor students compare Growing seasons

2015 GS Calculator
Emery develops easy GS Calculator

:) :) :) 2016
All Student Compare Growing season data

Fall 2011
Student collect Data first time-All students

Fall 2012
Student Collect Fall Data- 1 growing season done.

Fall 2013
Students collect 3rd fall data

Fall 2014
Honors student's collect 4th fall season

Fall 2015
5th fall season -All students

Spring 2012
Student collect first Spring data

Spring 2013
Student's collect 2nd Spring Data

Spring 2014
Students collect 3rd spring data

Spring 2015
4th spring data