

# Harvard Forest Schoolyard Ecology

## Lightning Round in the time of COVID-19



April 9, 2020



# Fort Greene Brooklyn Technical High School

Teacher: Elisa Margarita

Buds, Leaves, and Global Warming

Fall Leaf Drop

Citizen Science, Schoolyard Ecology

Tree #11

Tree Species: Norway Maple

Team Michelle Chen

Tracy Cheng

Cui Hua Lee Li

Branch E

0 = not fallen

1 = fallen

Jiaxin Mai

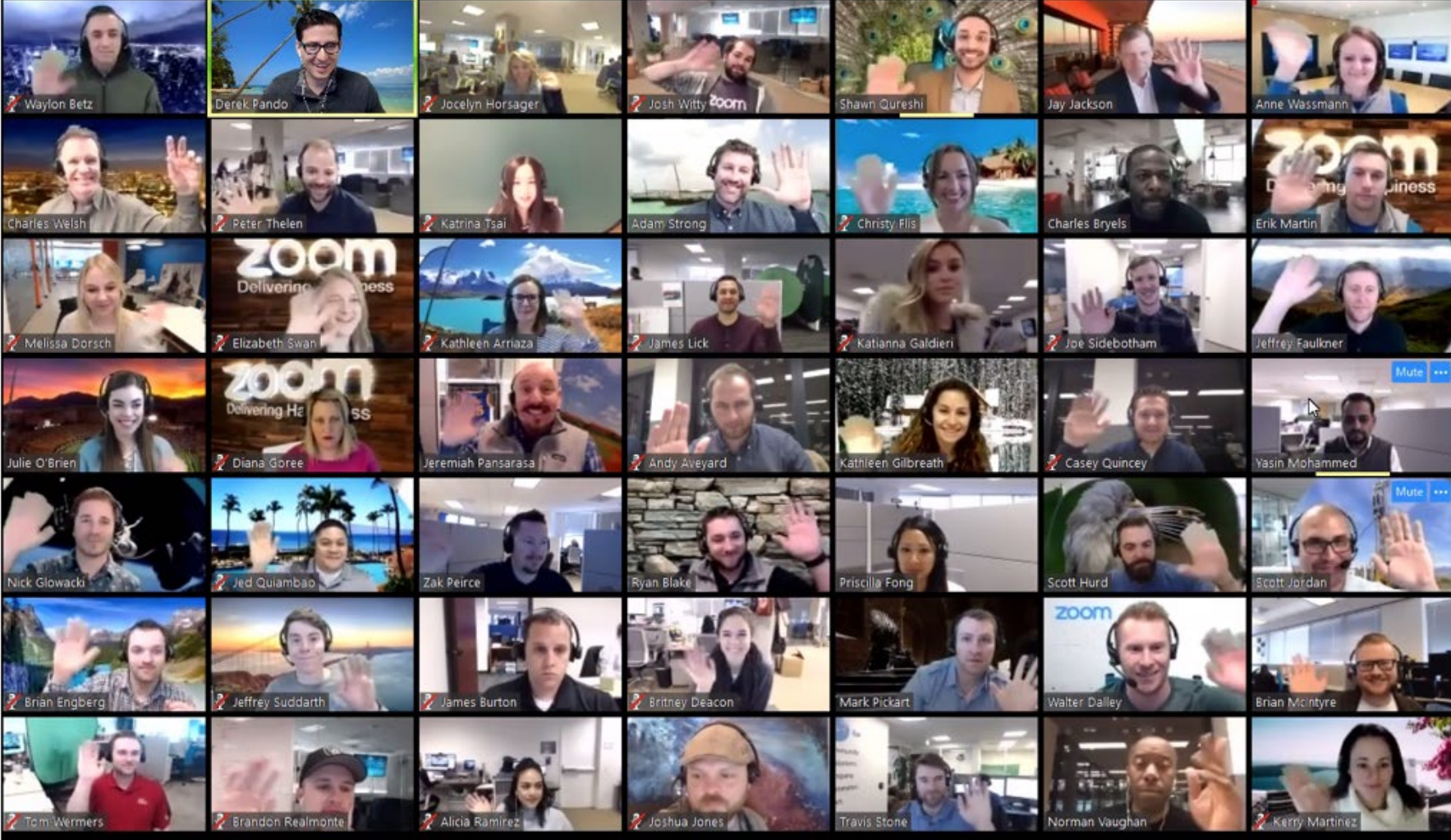
date	Leaf 1	Leaf 2	Leaf 3	Leaf 4	Leaf 5	Leaf 6	Leaves observed	Leaves fallen	Tree % not green
11/6/19	0	0	0	0	0	0	6	0	5
11/15/19	0	0	0	0	0	0	6	0	10
11/20/19	0	0	0	0	0	0	6	0	20
11/26/19	0	0	0	0	0	0	6	0	30

Branch F

date	Leaf 1	Leaf 2	Leaf 3	Leaf 4	Leaf 5	Leaf 6	Leaves observed	Leaves fallen	Tree % not green
11/6/19	0	0	0	0	0	0	6	0	5
11/15/19	0	0	0	0	0	0	6	0	10
11/20/19	0	0	0	0	0	0	6	0	20
11/26/19	0	0	0	0	0	0	6	0	30



# ZOOM with students on Spring Protocol



Elisa Margarita



# St. Mary's Parish School

Teacher: Mary Reed

New Sweet Gum Tree





# Playing Buds, Leaves and Global Warming Mystery Game



Mary Reed



# Bartlett Community Partnership School, Lowell, MA

What kind of trees are in our playground?



Teaching basic observations skills of  
identification and sketching

Teacher: Laura Schofield



# Assignment “Get Tree Branch to Bloom”

## Week 1 - Scientists

#1 Observations of Animal LIVE WEBCAM 3

#2 Observations of Penguins

#3 Get Tree Branch to Bloom



Laura Schofield



# O'Maley Innovation Middle School, Buds/Leaves, 2019-2020

Teachers: Dan Thomases  
Caitlin Sumner

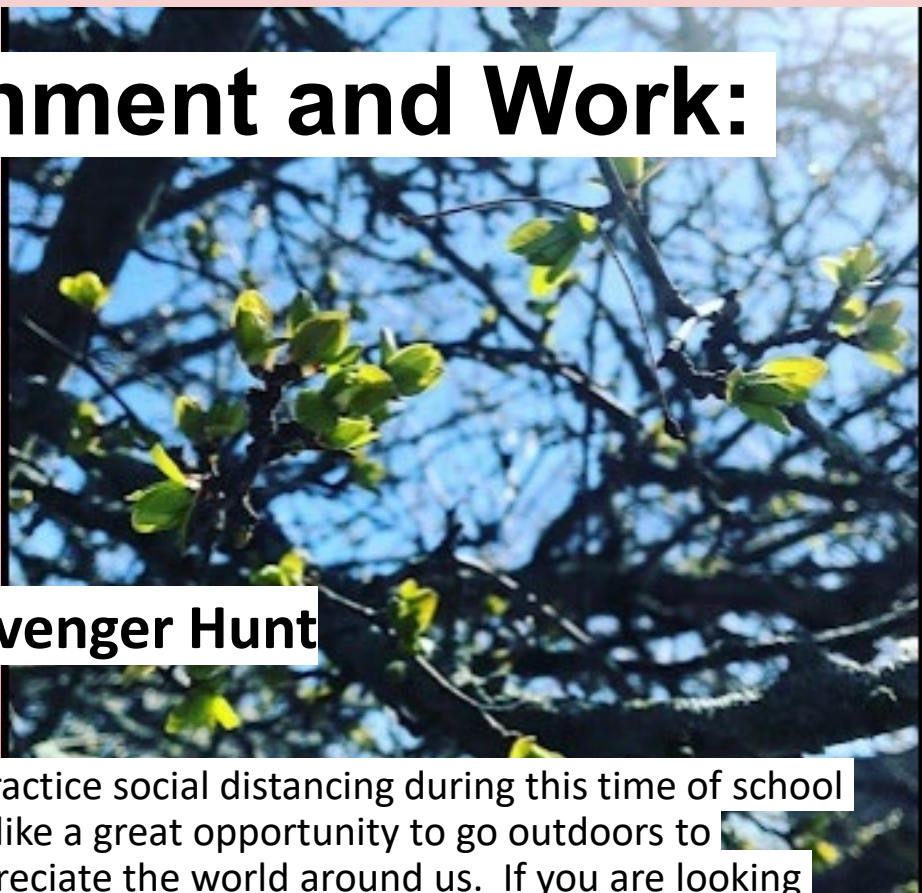


Students took observations of leaf drop September – November 2019.

Our site includes an ash tree, red oaks, Norway maples, a cherry, an apple, and a staghorn sumac.



# Assignment and Work:

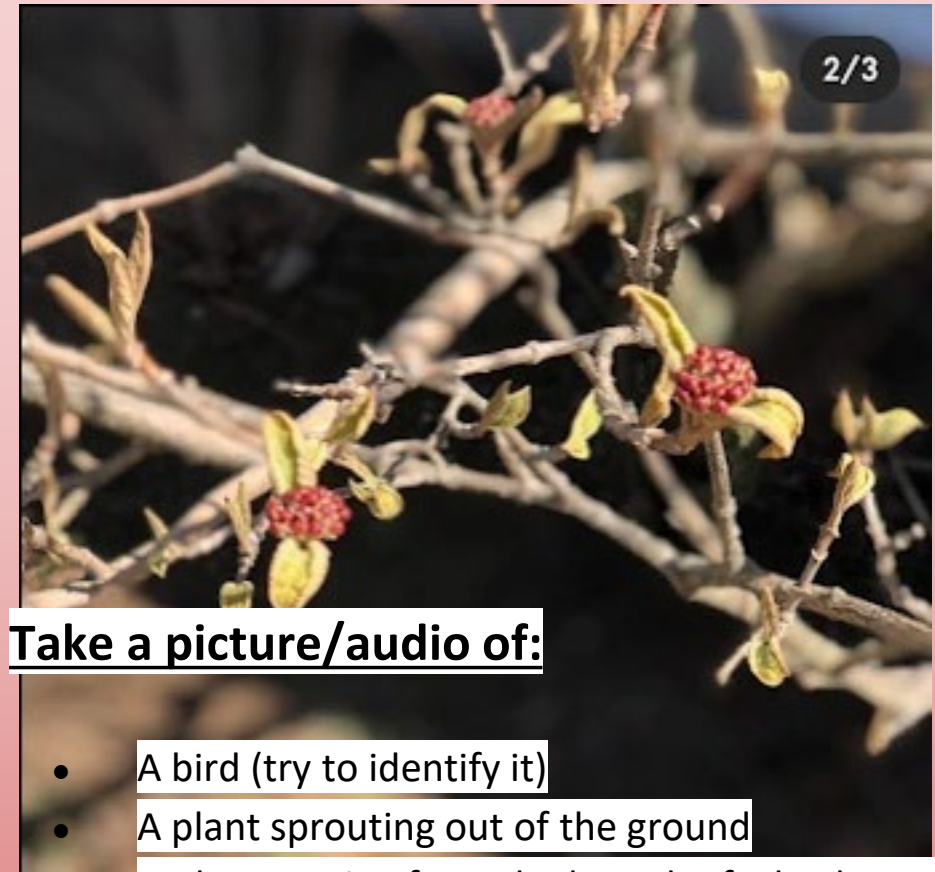


## Nature Scavenger Hunt

Since we must practice social distancing during this time of school closure it seems like a great opportunity to go outdoors to observe and appreciate the world around us. If you are looking for an alternative activity that takes you outdoors and away from the computer please join us in this scavenger hunt.

Find an example of each of the following and take a picture/audio recording of each example. Send each photo/audio recording to your science teacher and we will post it on our google classrooms to share.

Dan Thomases and Caitlin Sumner



## Take a picture/audio of:

- A bird (try to identify it)
- A plant sprouting out of the ground
- Buds sprouting from the branch of a bush or tree
- A Vernal Pool
- A frog or salamander
- Sound of Peepers or Wood Frogs
- A bird call (try to identify the bird if you can)
- An example of weathering (chemical or physical weathering of rock)
- Glacial erratics (rocks dropped by the continental glacier of the last ice age)



# Vernal Pool, Buds, Leaves and Global Warming and Our Changing Forest Studies at Mass Audubon's Drumlin Farm Wildlife Sanctuary, at the Concord MS vernal pool and with Lowell High School Students Sally Farrow 2020





# Looking to the Future. Keeping Connections. Spreading the Word. Interpreting the Data and Communicating the Results

- Conducting Harvard Forest research virtually
- Maintaining Buds study when no longer at the school
- Connecting with students this spring when schools are closed
- Doing Harvard Forest Research without access to property
- Making the results of Harvard Forest Research available to public
- Spreading the word about climate change with the Harvard Forest Schoolyard LTER program

Sally Farrow





# Harvard Forest Schoolyard Ecology Program





Research Projects

[f](#) [t](#) [g](#)

 Buds, Leaves & Global Warming

 Woolly Bully: The Invasive Pest, the Hemlock Woolly Adelgid

 Water in the Landscape: Vernal Pools



 Our Changing Forests: How Do Forests Grow and Change Over Time?

K-12 & Schoolyard LTER

Through the Fisher Museum and LTER program, the Harvard Forest offers a variety of formal and informal programs for local and regional schools.

Opportunities include:

- Harvard Forest Schoolyard LTER Program: Field-based research and professional development for K-12 students and teachers.
- Field trips to the Harvard Forest nature trails, research sites, and the Fisher Museum.
- Internship opportunities for Antioch University master's students.

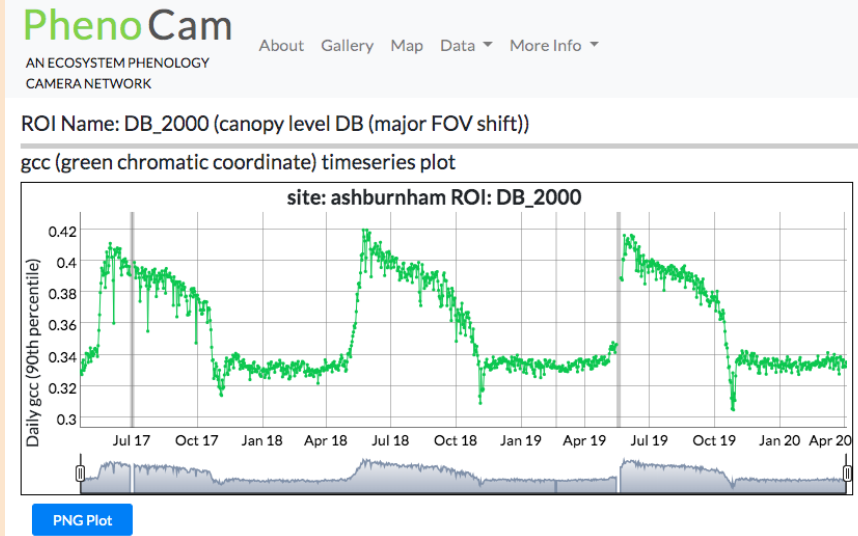


Teacher: Kate Bennett  
J.R. Briggs Elementary School





ashburnham - NetCam SC - Mon Apr 06 2020 08:35:47 EST - UTC-5  
Camera Temperature: 31.0  
Exposure: 42



**PhenoCam**  
AN ECOSYSTEM PHENOLOGY  
CAMERA NETWORK

### PhenoCam

AN ECOSYSTEM PHENOLOGY CAMERA NETWORK

About Gallery Map Data More Info

kbennett42

#### nationalelkrefuge

Welcome!

The PhenoCam Network is a cooperative continental-scale phenological observatory that uses imagery from networked digital cameras to track vegetation phenology in a diverse range of ecosystems across North America and around the World. PhenoCam was established in 2008 and currently includes over 500 sites. The image archive includes over 30 million pictures. Imagery and data are made publicly available in near-real time through this web page.

Data from PhenoCam can be used for phenological model validation and development, evaluation of satellite remote sensing data products, benchmarking earth system models, and studies of climate change impacts on terrestrial ecosystems.

For more information, please select from the menu items above.

#### Latest PhenoCam Data Release

PhenoCam Dataset v2.0: Vegetation Phenology from Digital Camera Imagery, 2000-2018

PhenoCam Dataset v2.0: Digital Camera Imagery from the PhenoCam Network, 2000-2018

#### Tweets by @PhenoCam

The PhenoCam Network @PhenoCam  
#FunsOfPhenocam  
Baa ...  
Meh ...

Embed View on Twitter

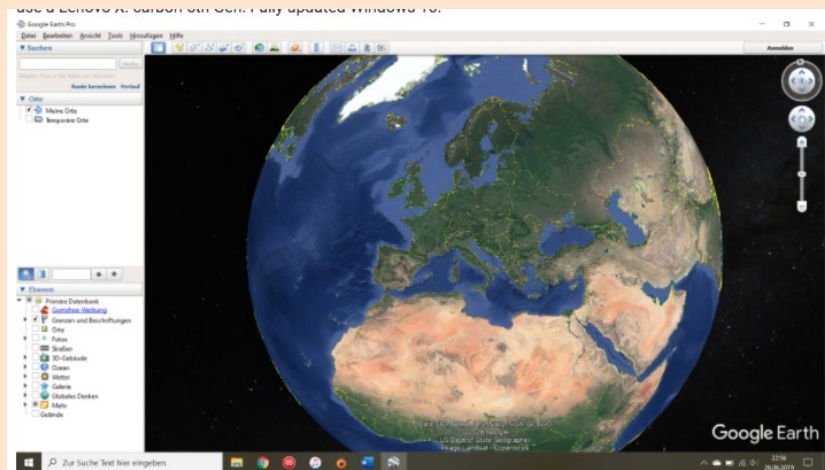
© 2012-2019 The University of New Hampshire • Durham, NH 03824  
This material is based upon work supported by the National Science Foundation under Grant No. EF-1065029. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Teacher: Kate Bennett  
J.R. Briggs Elementary School



# Hemlocks at Home

Teacher: Kate Bennett  
J.R. Briggs Elementary School





On February 5<sup>th</sup>, CT Audubon at Pomfret hosted a teacher workshop for both “Our Changing Forests” and “Buds & Leaves”



During our OCF and Buds & Leaves workshop, we identified and labeled 10 trees on the property (close to the center) with the intention of engaging learners during spring field trips. The goal was to prep teachers for the Harvard spring training session, and to have them actively observe and measure.

We also visited and measured at one of our OCF forest plots on the Audubon property. Teachers worked with Fiona Jevon and practiced the OCF protocols.




Marjorie Porter  
Jane Simao


Connecticut Audubon Society at Pomfret, in conjunction with Harvard Forest, is offering a pilot workshop for teachers in Northeastern Connecticut. Join us at our center at 218 Day Rd.  
**February 5, 2020 (Feb. 6 snow date) 9AM to 3PM; Lunch included!**  
 During this **full day of training**, teachers will work with Harvard staff to learn more about the program and how to implement it at their school.

- Engage your students in authentic research with Harvard Forest's Schoolyard Ecology Program <https://harvardforest.fas.harvard.edu/research-projects>
- Collect real data in your school yard and contribute to Harvard Forest's comprehensive database
- Prepare for Harvard's in-depth summer institutes where you will continue your training

**Elementary School:**  
 Grades 2-4 teachers will be introduced to the "Buds, Leaves, and Global Warming" project. Teachers will learn to monitor leaf development on trees in their own schoolyard.

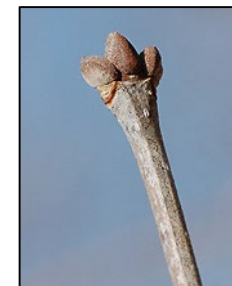


**Middle/High School:**  
 Grades 6-12 teachers will be introduced to Harvard's "Our Changing Forests" project. Participants will learn how to establish and monitor a schoolyard plot in order to document forest change over time.



CT Audubon PLOT #1		
Tree ID #	Diam. Cm	Tree Species
10		Black Birch
11		Red Oak
12		Eastern Hemlock
13		Black Birch
14		Eastern Hemlock
15		Red Maple (dead)
16		Black Birch
17		Black Birch
18		Eastern Hemlock (dead & fallen)

White ash





# Connecticut Audubon Center at Pomfret



Jane Simao

On February 5, 2020 we hosted a workshop for local teachers.



Pamela worked with teachers to identify and label trees on the Audubon property suitable for use with the Buds and Leaves protocol.





Because CT Audubon spring programs and field trips have been cancelled, we are providing “at-home” lessons (aligned to the NGSS) that encourage young learners to be “hands-on” in nature.



One of these lessons will be about phenology.

Naturally we are emphasizing the 8 Science and Engineering Practices, but with a focus on plants, buds, and leaves.

These slides will be part of an enhanced podcast available to children.

Fun with Phenology (pronounced *fen-ol-a-gee*)

These maple flower buds have “burst” open. Citizen scientists like *you* can keep track of this each year!



Maple buds brought indoors and placed in water

Day 1



Day 2

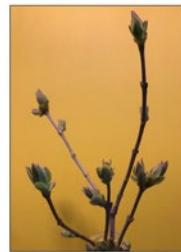


Day 3



Lilac buds taken indoors and placed in water

Day 1



Day 2

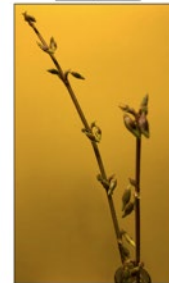


Day 3

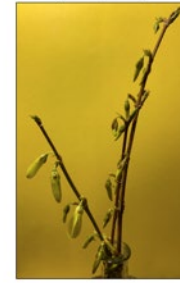


Forsythia buds taken indoors and placed in water

Day 1



Day 2



Day 3



Marjorie Porter  
Jane Simao



# Levy's keeping the BLG faith, Spring 2020

Louise Levy  
Belchertown High School

1A	C →	3/31/2020	
1B	C →		
2A	C →	<u>ruffy flower bds</u>	
2B	C →	4 open	
3A	C →		
3B	C →		
4A	C →		
4B	C →		
6A	C →	<u>no flower bds</u>	
6B	C →		
7A	C →		
7B	C →		
11A	C →		
11B	C →		
12A	C →		
12/B	C →		

March 31 2020



## Remote learning challenges:

1- Mid-March: find and photograph skunk cabbage

2- This week's challenge is to find what is pictured here, find and take a pic of one near you, open an email, copy and paste my pic side-by-side with yours, and then tell me what these are.

Hint: they grow on a tree, not a shrub.

None yet!

Louise Levy  
Belchertown High School







Michael McCarthy  
Thurston Middle School

**With the help of the co-teacher, three of my small group of 7 boys in Grades 6-8 learn how to measure the DBH of this very large oak in the Our Changing Forests study plot in Thurston Woods for (Sep 2019).**





Michael McCarthy  
Thurston Middle School

**With the help of the co-teacher, two of my small group of 7 boys in Grades 6-8 learn how to identify and record the state of the six leaves of an American beech in the Buds, Leaves and Global Warming study plot in Thurston Woods (Nov 2019).**



# Overlook Middle School Grade 7 Buds



Teacher: JoAnn Mossman



# Remote Learning Ideas

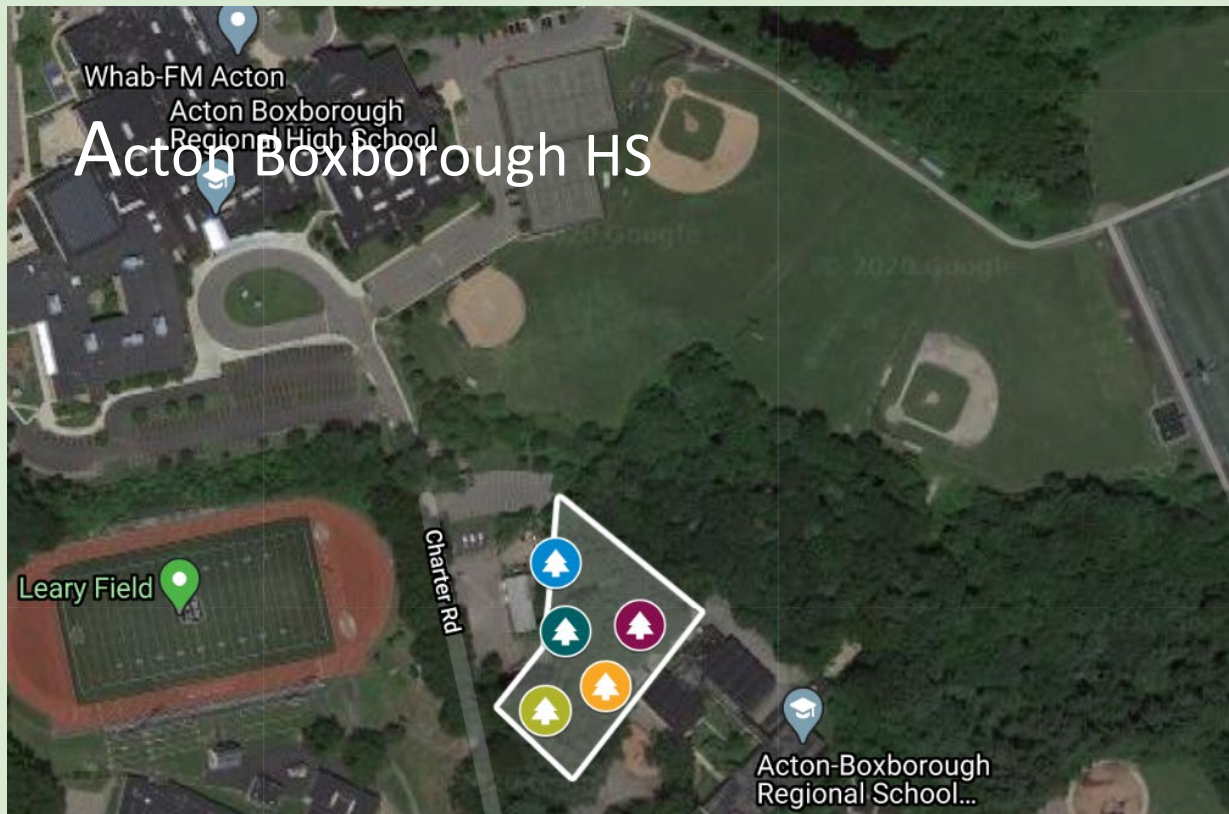


Teacher: JoAnn Mossman  
Overlook Middle School





# Woolly Bully - Acton-Boxborough



Nancy Young

- Year One!  
-AP Envi Sci.  
(3 sections)

Sep. - New Growth /Crown  
Health

May ? - Egg Sampling



**Sorry but not connecting with students  
about the project right now**

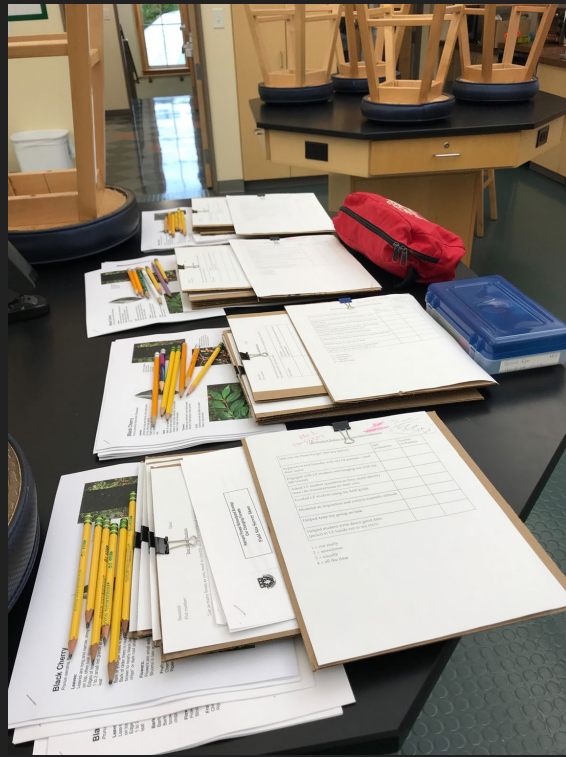
**Preparing for May AP Exam!**

Nancy Young  
Acton-Boxborough



# Lexington Montessori School

Kim McMaken-Marsh



James: 5'11" + tall  
Date: 11/8/19

Tree #	Identification	Our Diameter Estimate (in cm)	Circumference (in cm)	Diameter (in cm)
13	Red Oak	75	220	70.0
14	Red Maple	12	34	10.8
15	Pignut Hickory	7	18	6.7
16	White Oak	15	56	17.8
17	Black Oak - Dead	23	72	23.0
18	Black Oak	40	120	38.1
20	Sugar Maple	15	45	14.3
21	Red Maple	9	35	11.3
22	Black Cherry - Dead	17	59	19.3

$d = \frac{C}{\pi}$





Dear families-

April 3, 2020

Your LE Elder or Middle Schooler may have told you last semester about a forest data collection project we started. We marked, identified, and measured 30 trees in the LMS woods. Our goal is to have a long-term data set that tells us how the forest changes over time. It's part of a program called [Our Changing Forests](#) with Harvard Forest.

Last time we measured together, we had LE and MS pairs working on collecting data. It was a cold day in December, and it was our first time working with the tools. We brought our data inside, drank tea together and did calculations, and we discovered that there were many discrepancies in the data. We planned to go back out when the weather eased up, and we haven't gotten to do that yet.



Here's where you come in. Would you like to bring your child over to the LMS woods and help with some measurement? If so, read on.

You'll need:

Paper and pencil

Some hard clipboard-like surface

A flexible measuring tape that you can wrap around the trunk of a tree (preferably metric)



Lexington Montessori School

Kim McMaken-Marsh



## Two Informative Writing Assignments--7th Grade Science, Glen Urquhart School Emilie Cushing

### Summary Paragraph--Harvard Forest Data

**Directions:** For this assignment, you will write a paragraph summarizing the data collection portion of the Harvard Forest Schoolyard Ecology Project. You will need to use the Tree Data Sheet, and the Field Site Description Sheet.

**Topic Sentence:** Introduces what the paragraph will be about

**3-4 sentences:** Describe the plot:

- How big is it?
- What tree species are in the plot?
- How many alive, how many dead?
- Which was the biggest? The smallest? Give the sizes.
- Further: Describe one piece of information you determined from the spreadsheet you created in math.

**3-4 sentences:**

- Name two invasive species in the plot.
- What pest may have been in the plot? Was it found?
- Describe two human disturbances or weather events that occurred in the plot.
- Include one other piece of information from the Field Site Description Sheet.
- Further: Describe what kind of impact one of the invasive species in the plot could have on other species.

**Summary Sentence(s):** This plot will be measured again in 3 years.

Describe one thing that you think will be the same, and one thing you think will be different. Also, include information about 1-2 changes that occurred over the last 3 years in the plot.

### Trees and Climate Change Summary

For this writing assignment, you will provide information that explains the connection between carbon, trees, and climate change. Use your CER-trees sheet, and your Carbon Cycle, Trees, Climate Change questions.

**First Paragraph: What is a tree mostly made of?**

- Topic sentence: What is your claim? Supporting sentences: Provide a piece of evidence and its reason. (2-3 sentences)
- Concluding sentence: Summarizes your reason for making your claim.

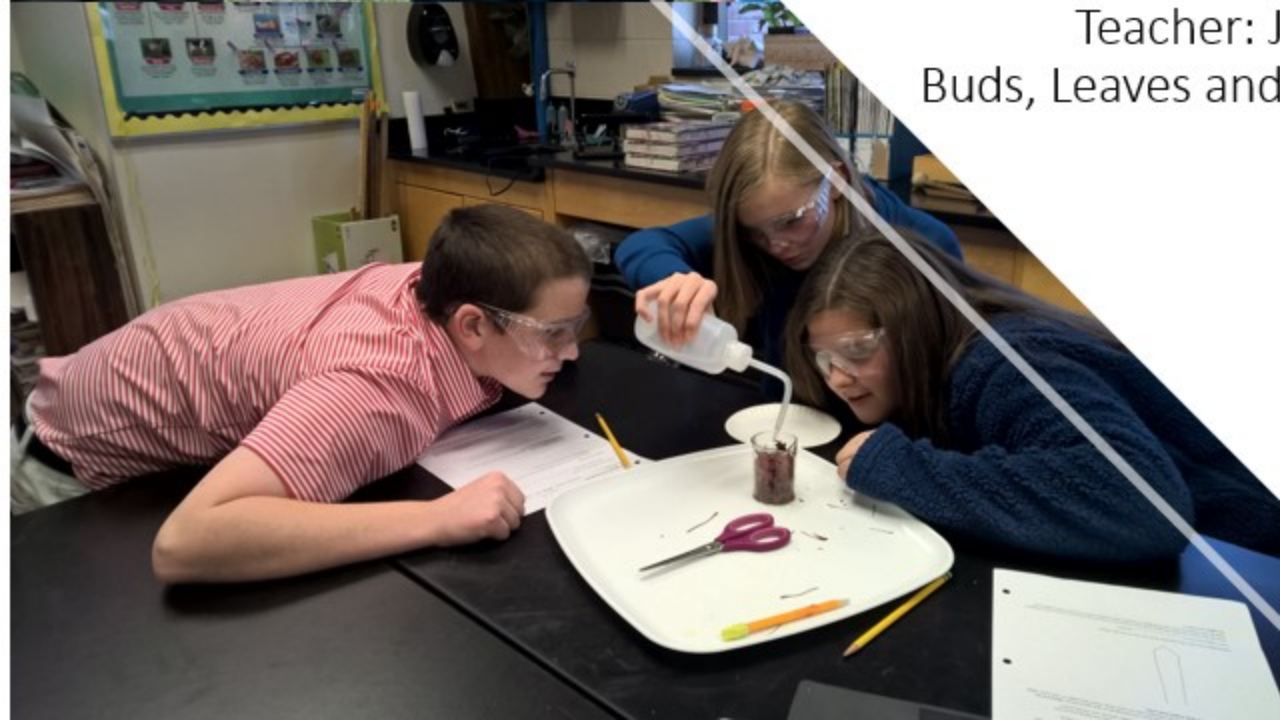
**Second Paragraph: How do trees mitigate the effects of climate change?**

- Topic sentence: States what the paragraph will be about
- Supporting sentences will help explain:
  1. What role carbon dioxide plays in the atmosphere.
  2. Some ways that excess carbon dioxide gets into the atmosphere.
  3. What carbon sequestration is, and how long wood holds onto carbon.
  4. Some things we can do to maximize carbon sequestration.
- Concluding sentences: If you could tell a land developer in our area what impact cutting down trees has, what would you tell them? (2-3 sentences).





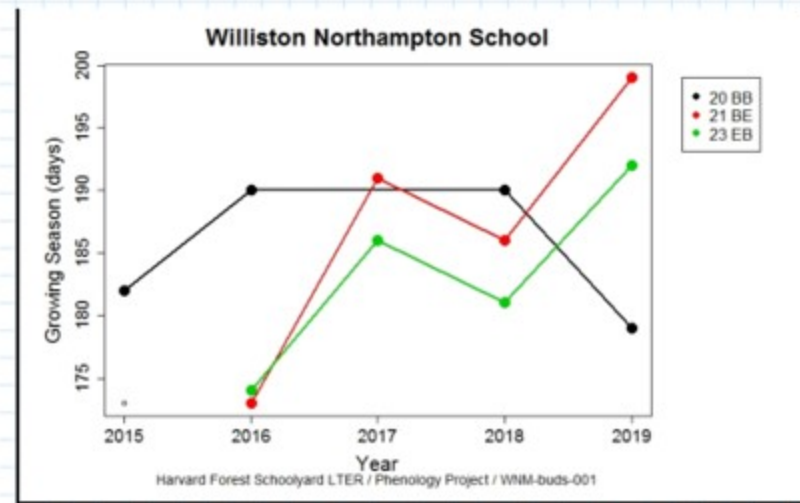
Williston Northampton School  
Fall 2019  
Teacher: Jane Lucia  
Buds, Leaves and Global Warming





# Spring Project Plans (Quarantine style): Graphing from the Data, Observing a backyard tree using the protocol Student samples

Length of the Growing Season on Williston's Campus



This graph shows three different trees growing seasons through out 2015 - 2019. My research tree (23 EB) is different than the two other trees. The black line shows that the tree has had a pretty consistent growing season throughout the years because it is some what in the same area. The red line shows that the tree has definitely grown in number of day in a growing season but is pretty un consistent because the graph shows it starting at the bottom and ending at the very top. The green line (my tree) has a similar graph to the red because it has gone up a lot from where it was started but maybe isn't quite as old as the red one because it hasn't reached the top.

Tree Species: apple tree  
(Go Botany: <https://robotany.nativeplanttrust.org/>)

Tree location: stands alone or in a group sun or shade on a hill, flat or hollow

Tree description: young or mature one trunk or multiple trunks alternate or opposite branching

Describe the bark: smooth, thick

Other characteristics you could use to describe your yard research tree:

the branches have many buds

Data sheet 1 Date 4/5/2020

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

SP = slightly Puffy  
MP = Moderately Puffy  
VP = Very Puffy

	Bud 1	Bud 2	Bud 3	Bud 4	Bud 5	Bud 6
<b>Closed:</b> Bud is closed and not puffy	X	X	X	X	X	X
<b>Puffy:</b> Bud is swollen or opening with no unfolded leaf						
<b>Open:</b> Bud has opened and whole leaf is visible (budburst)						
<b>Bud Fallen Off</b>	⊕					

2. How many buds were observed in all? 6  
Of these, how many were Closed? 6 Puffy? 0 Open? 0

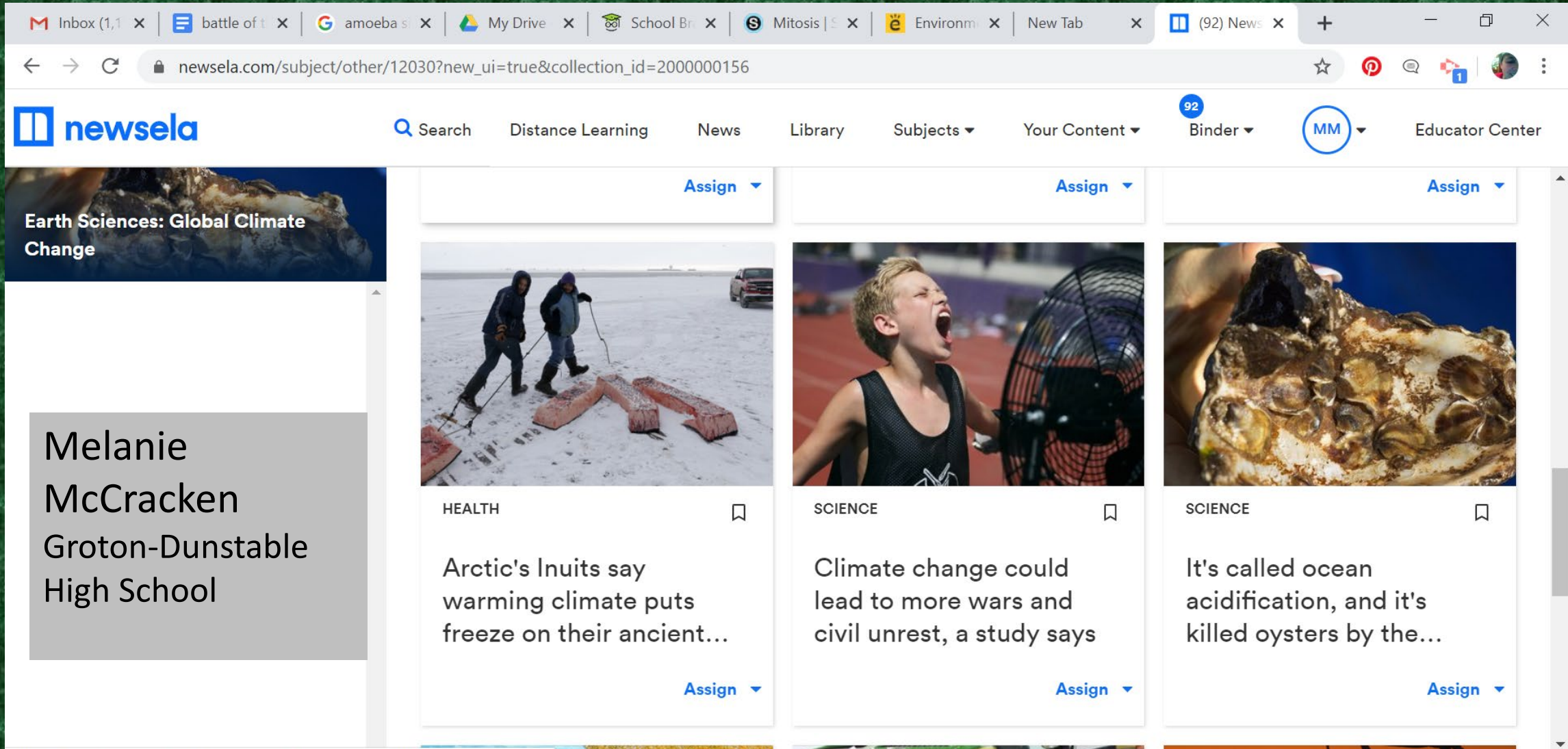
3. Look for the open bud with the largest leaf.  
Measure the leaf length in centimeters: No open

4. **Field notes:**  
Temperature (degrees Celsius): 14°C Time of Day  
Humidity(%): 61%  
Circle one: Sunny Cloudy Rainy  
Other observations and Notes: A little sun poking in

Jane Lucia



# NEWSELA: I used NEWSELA to assign optional reading to Environmental science students.



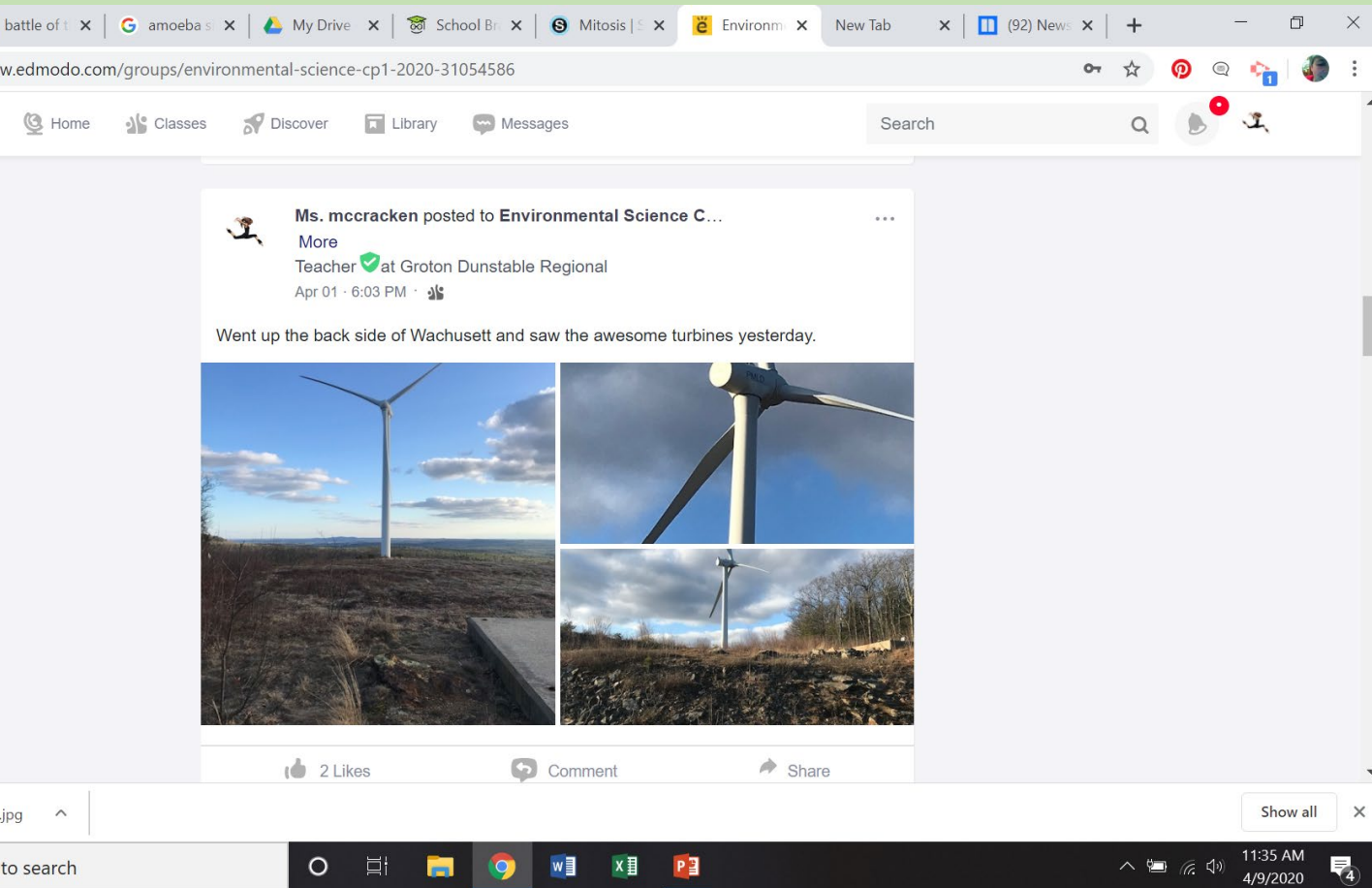
The screenshot shows a web browser window with the Newsela website. The browser's address bar displays the URL: [newsela.com/subject/other/12030?new\\_ui=true&collection\\_id=2000000156](https://newsela.com/subject/other/12030?new_ui=true&collection_id=2000000156). The Newsela logo is in the top left, and navigation links for Search, Distance Learning, News, Library, Subjects, Your Content, Binder (with a notification of 92 items), and Educator Center are visible. A user profile icon with the initials 'MM' is also present.

On the left side, there is a sidebar with the text: **Earth Sciences: Global Climate Change**. Below this, a grey box contains the user's name and school: **Melanie McCracken**, **Groton-Dunstable High School**.

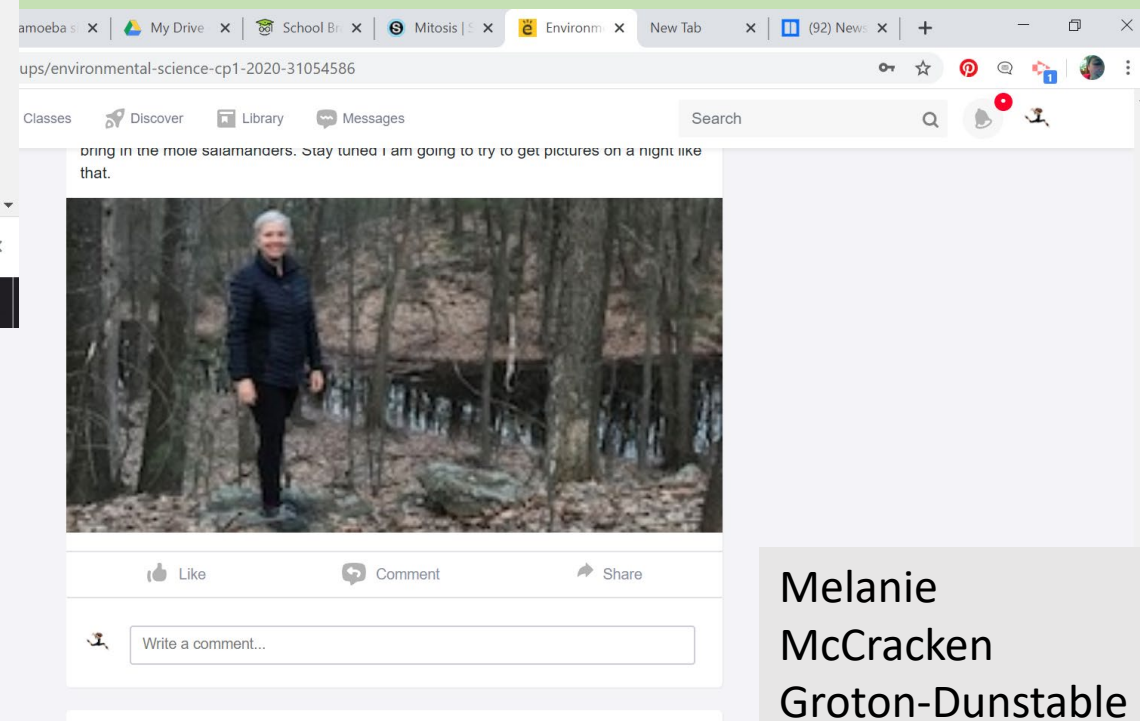
The main content area displays three article cards, each with an 'Assign' button:

- Article 1:** Features an image of two people in winter gear pulling a sled on a snowy, icy landscape. The category is **HEALTH**. The title is "Arctic's Inuits say warming climate puts freeze on their ancient...".
- Article 2:** Features an image of a young boy shouting with his mouth wide open, with a large black fan in the background. The category is **SCIENCE**. The title is "Climate change could lead to more wars and civil unrest, a study says".
- Article 3:** Features an image of a hand holding a large, dark, textured rock. The category is **SCIENCE**. The title is "It's called ocean acidification, and it's killed oysters by the...".





I use Edmodo to show students what I do with my time during the day. I also post assignments.



I have not introduced OCF or the Buds project. We are on block schedule and were only a month into school when the closure occurred

Melanie McCracken  
Groton-Dunstable High School

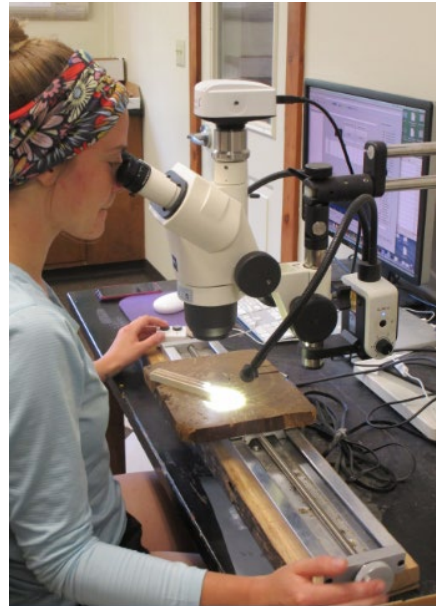


# RET- Research Experience for Teachers

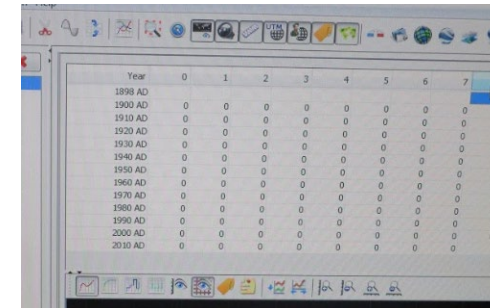
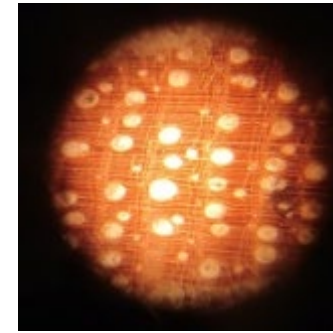
## Real Experience with Real Scientists



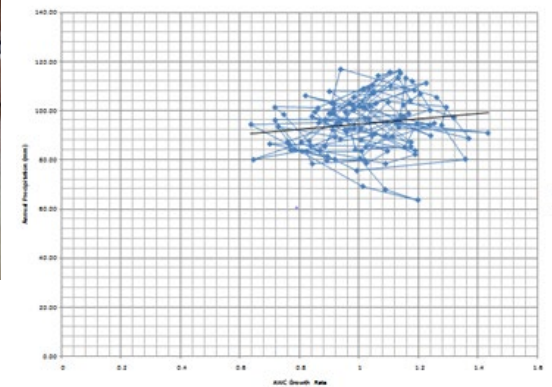
Elicia Andrews



Quabbin Regional High School



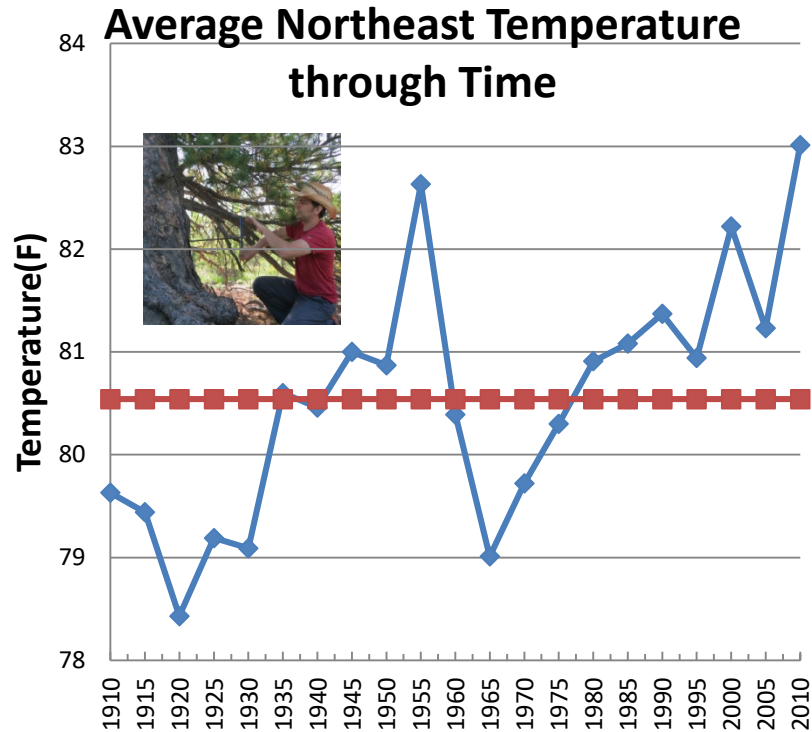
Year	0	1	2	3	4	5	6	7
1898 AD								
1900 AD	0	0	0	0	0	0	0	0
1910 AD	0	0	0	0	0	0	0	0
1920 AD	0	0	0	0	0	0	0	0
1930 AD	0	0	0	0	0	0	0	0
1940 AD	0	0	0	0	0	0	0	0
1950 AD	0	0	0	0	0	0	0	0
1960 AD	0	0	0	0	0	0	0	0
1970 AD	0	0	0	0	0	0	0	0
1980 AD	0	0	0	0	0	0	0	0
1990 AD	0	0	0	0	0	0	0	0
2000 AD	0	0	0	0	0	0	0	0
2010 AD	0	0	0	0	0	0	0	0



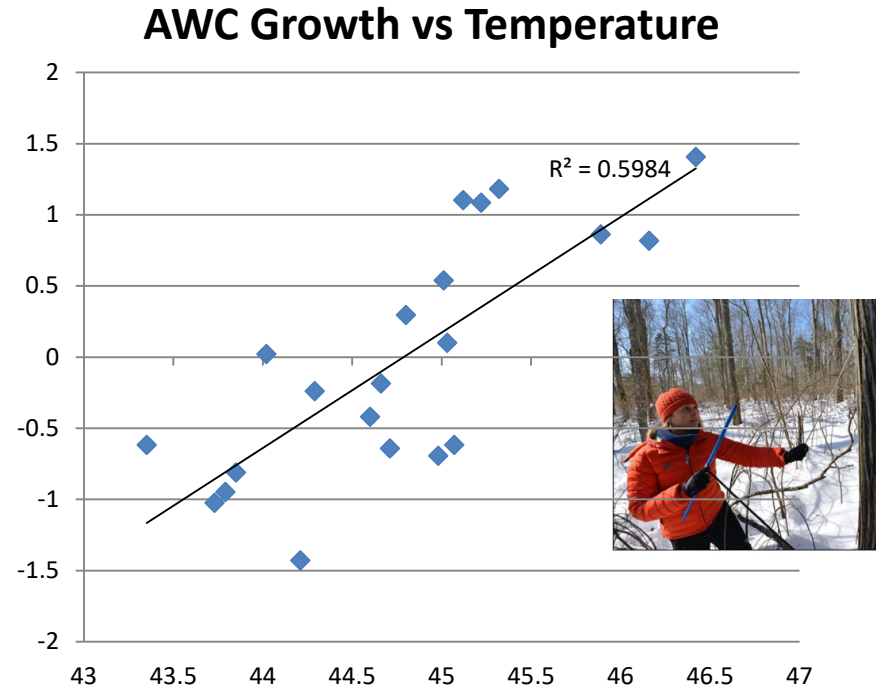


# Middle School Data Nugget

Is the Northeast United States warming?



How is Atlantic white cedar responding to changing temperature?



Journal Article: Reconstructing Northeastern United States temperatures using Atlantic white cedar tree rings--Environmental Research Letters, 2017

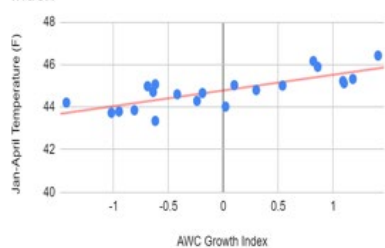
Elicia Andrews



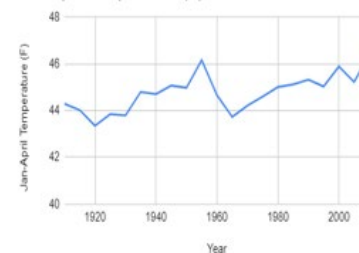
# Piloting the Data Nugget in the Classroom



Jan-April Temperature (F) vs. AWC Growth Index



Jan-April Temperature (F) vs. Year

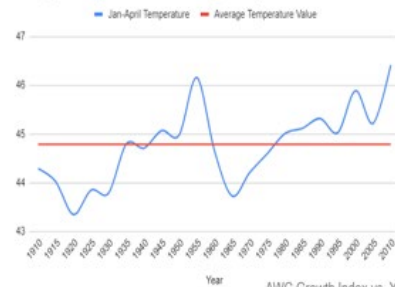


AWC Growth Index vs. Year

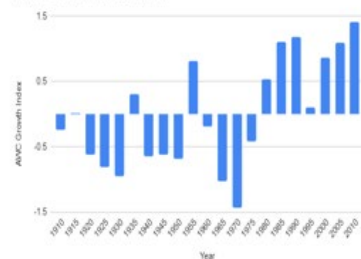


AWC Growth Index

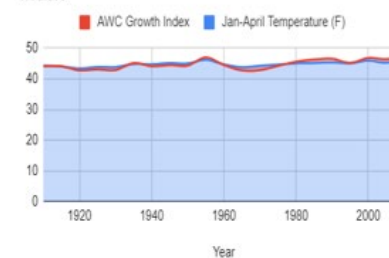
Jan-April Temperature and Average Temperature Value



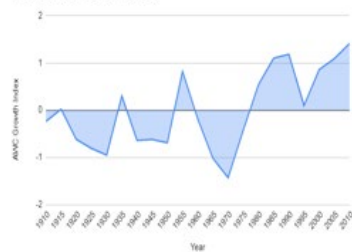
AWC Growth Index vs. Year



Jan-April Temperature (F) and AWC Growth Index



AWC Growth Index vs. Year



[Digital Resource for Learning](https://www.kamiapp.com/)

<https://www.kamiapp.com/>

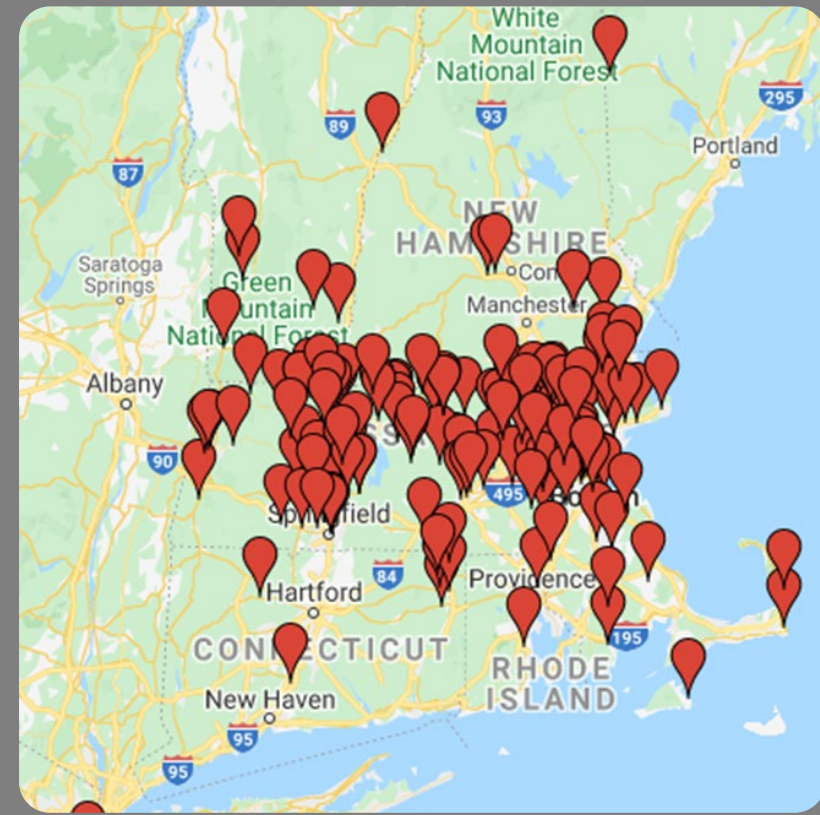
Elicia Andrews





# What's New at Harvard Forest? Schoolyard Eco That is....

- Research Experience for Teachers Grant Supplements:
  - Bill Munger/Tim Whitby (delayed due to HF closure)
  - Jonathan Thompson /Josh Plisinski (to continue).



- New lesson plans for the NELF Explorer (Alcorn, Sautter, Scanio)
- Northern Arizona Univ. and HF Phenocam workshop (delayed due to COVID)
- Our Changing Forests Northern Woodlands Video Link

**4,500 Students** participating this year

**222 Teachers** submitted Data 2004-2019

**Over 200 Schools in 7 States** have contributed since 2004.

Activities that bring real scientific data into the classroom, guiding students through the entire process of science while building their quantitative abilities.

SEARCH

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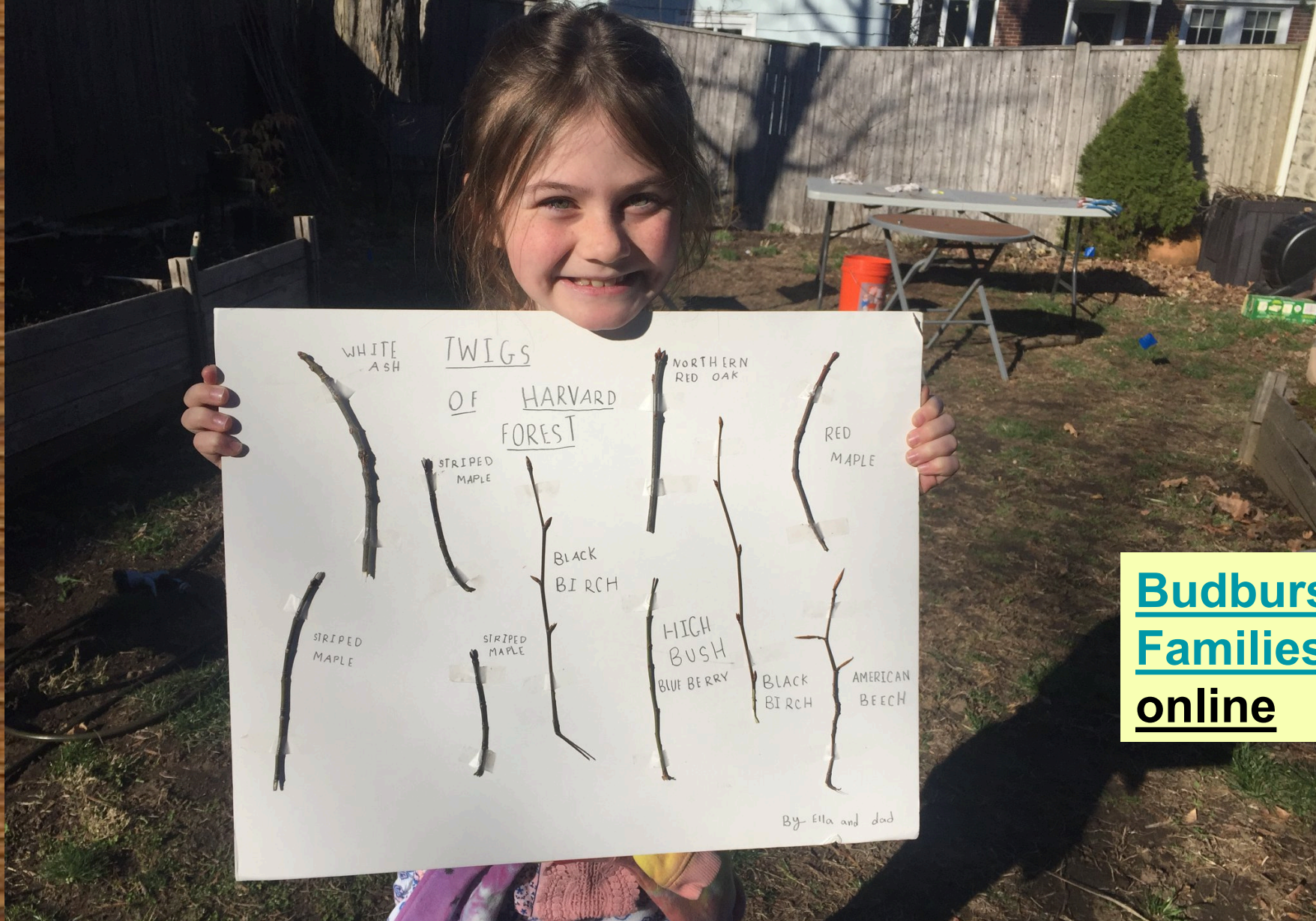
climate change competition core

reef dendrochronology disturbance

ecology

2019 RET: Elicia Andrews  
Mentor: Neil Pederson





[Budburst for Families activities online](#)

Backyard Eco Project from "Mathewson Elementary"  
Brooks Mathewson, ecologist-educator-photographer