

# *Chestnuts and Change in Appalachia: American Chestnut Restoration as a Springboard for Science and Service in the Undergraduate Classroom*

Dr. Jennifer Koslow  
Department of Biological Sciences  
Eastern Kentucky University

# Brief bio

- Born in Kokomo, Indiana
- Education in biology and environmental conservation took me to Atlanta, Miami, southern Indiana, Costa Rica, and Ithaca, NY. Landed a faculty position at Eastern Kentucky University
- Research in plant ecology and evolution
  - Plant pathogens in natural systems
  - Struck by the power of pathogens to change entire ecosystems
  - Endangered species conservation (Running buffalo clover)
- Teaching: Ecology, Evolution, Botany, Plant Ecology from 100 to 800 level

# Overview

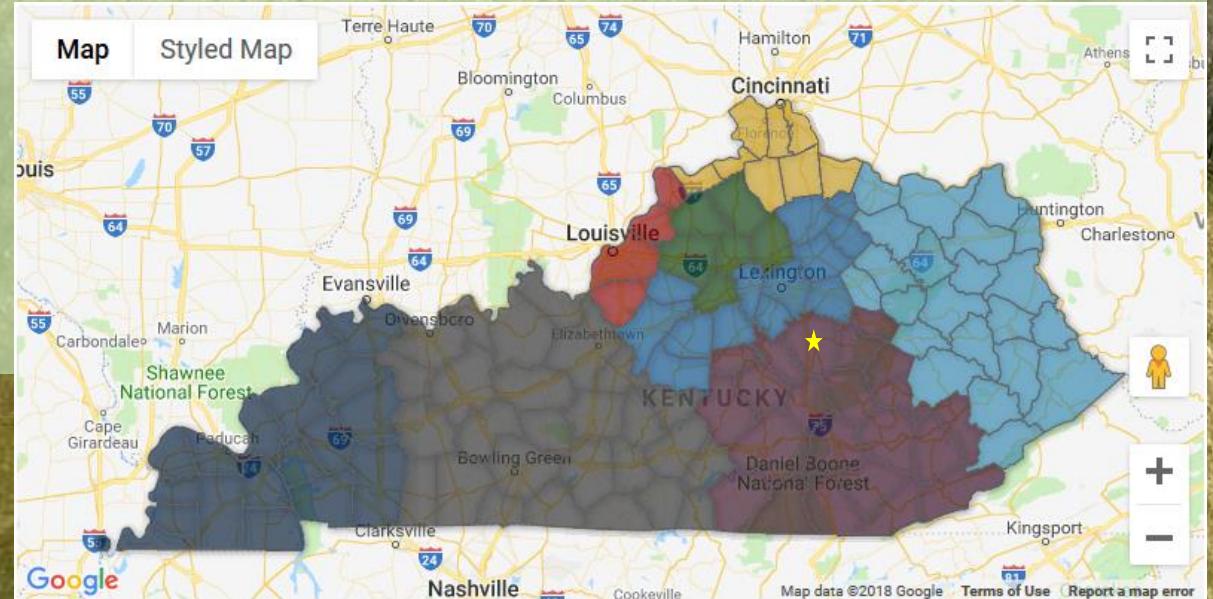
- Background: Eastern Kentucky University and TACF *recent* history
- Orchard workdays as outreach
- Teaching as outreach
- Tips for implementation

# Why is EKU invested in this endeavor?

- Universities in Kentucky required to provide service to their region
  - From EKU's Strategic Plan:

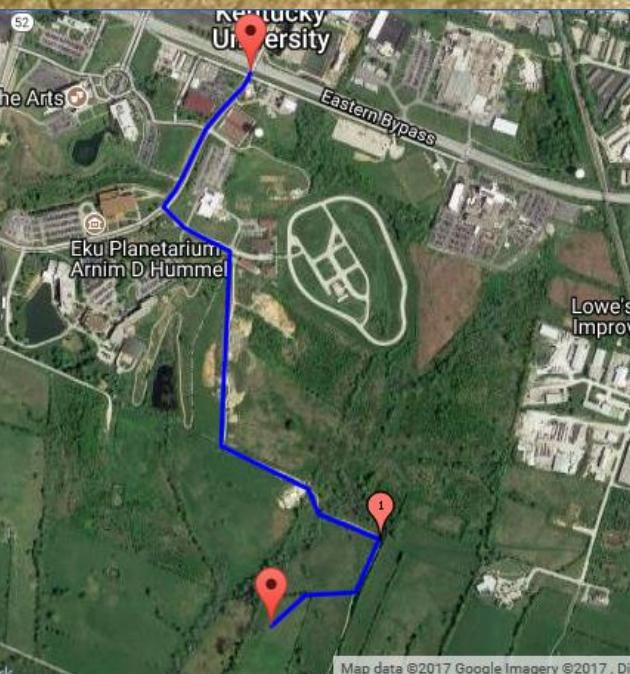
**“By applying our academic and professional expertise to collaborations with community stakeholders, we will improve the quality of life for the communities we serve. We will demonstrate our commitment to our communities and Region by actively seeking out those strategic opportunities that will provide direct benefits to the people of Eastern Kentucky.”**

EKU's region (purple) includes southeastern Kentucky, and therefore part of Appalachia



# Brief history of recent partnership between EKU & TACF

- Formally began in 2015 with an agreement to host a seed orchard
- Expected to remain for 30-45 years



April 2016

# Seed orchard history

- April 2016 planted ~1400 seedlings in new seed orchard
- February 2017 planted ~900 seeds
- March 2017 planted seedlings
- November 2017 planted seedlings
- April 2018 planted ~400 seedlings
- Approximately 2700 seedlings total with more to come



# 2016 Public Relations and Outreach

## EKU Stories



### Chestnut Resurgence Takes Root

### EKU Helping To Restore American Chestnut



EKU helping to restore iconic tree

Ricki Barker/ rbarker@richmondregister.com Apr 25, 2016



**THE RICHMOND  
REGISTER**  
Your local news source since 1917.

[EKU Alumni Magazine Fall 2016 2 page spread](#)

Preserving the  
**AMERICAN CHESTNUT**

Mighty souls from little acorn grow...  
This chestnut resurgence is one EKU's students and professors are a driving force behind.

With the April planting of approximately 1,000 saplings, the university's partnership with the American Chestnut Foundation to regenerate the once the most numerous and important tree species in the eastern United States and help reduce the threat of chestnut blight will have been completed. The work of the foundation is all but sped up by the first half of April, and the university's contribution to the effort is estimated to be the equivalent of EKU's use of only about one-tenth of its land area. "We're excited that the work of the EKU students and faculty will be the final part of the restoration of the American Chestnut Foundation," said Michael L. Tamm, president of the American Chestnut Foundation, "and we're grateful to the university for its support."

The university received a \$10,000 Tree Campus USA Arbor Day Foundation grant to establish a native Eastern Chestnut grove at the south end of campus, and the saplings were provided by the foundation.

For more information on the chestnut initiative, contact the Office of the Vice President for Research and Economic Development, the EKU Department of Biological Sciences, the Old Kentucky Home Arboretum, the EKU Wildlife Management Institute, the University Forest Advisory Committee, the Kentucky Department of Forestry, and the Kentucky Department of Agriculture.

Photo: EKU students plant American Chestnut saplings in a field near the university's eastern Kentucky campus.

Inset photo: Students plant American Chestnut saplings in a field near the university's eastern Kentucky campus.

Inset photo: A young American Chestnut tree.

Inset photo: A detailed botanical illustration of the American Chestnut tree, showing its leaves and fruit.

### EKU Sustainability video picked up by e-Sprout



But these little guys have been cross-bred with Chinese Chestnuts, which are immune to blight.

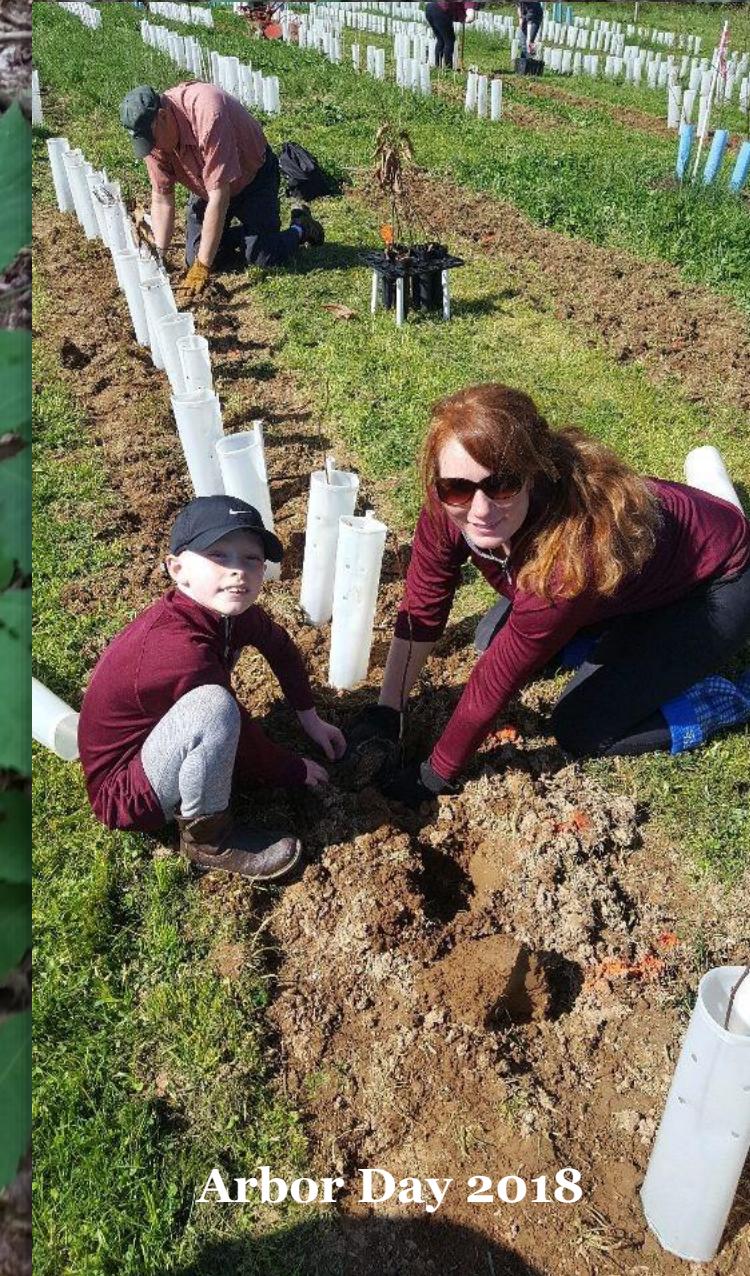
▶ ▷ ⏪ ⏵ 0:34 / 1:01

◀ ⏴ ⏵

24:58 / 27:33

# Seed orchard for outreach?

- Less press each year, but still lots of volunteer turnout for big events (e.g. Arbor Day planting days)
- Extra credit is a big incentive at the end of a semester
- Included in some course curricula by some faculty
  - Intro to Ecology and Evolution
  - Botany
  - Plant Ecology
  - Ecology
  - Appalachian Studies



Arbor Day 2018

# SENCER model



- SENCER, the signature initiative of the National Center for Science & Civic Engagement, is a national project focused on empowering faculty and improving STEM teaching and learning by making connections to civic issues.
- Ideal for General Education Science courses
  - Emphasizes connections between science and society
  - Upper-level instructors unfazed by the reduction in content!

# HON 317: Chestnuts and Change in Appalachia

- Inspired by the SENCER model
- General education “laboratory” science course for non-science majors
- 1<sup>st</sup> time, spring 2018, co-taught by Dr. Jen Koslow and Dr. Alice Jones
- 2<sup>nd</sup> time in spring 2019 with just me teaching
- Students in the Honors College
- Capacity of 22 students



# HON 317: Chestnuts and Change in Appalachia

**Course Description:** an interdisciplinary understanding of biological and geographic concepts of plant ecology, evolution, spatial distribution of ecosystems, and the relationship of healthy ecological systems and human health and wellbeing through the lens of the American chestnut and its historical relationship to Appalachian culture. Community-based research class with a culminating project of producing short videos designed to educate the public about important concepts for the American Chestnut Foundation and its cooperative orchard at EKU's Taylor Fork Natural Area.

# Vehicle to teach content and skills...

- Ecology
  - Ecosystems: Carbon cycling
  - Ecological interactions
  - Invasive species biology
- Geography and Earth systems
  - Global climate patterns
  - Biomes
  - History of the Earth
  - Map reading and interpretation
- Appalachian history and culture
- Evolution
  - Mechanisms of evolution
  - Biogeography
  - Speciation
- Quantitative reasoning
- Scientific communication styles
- How to engage the public with science

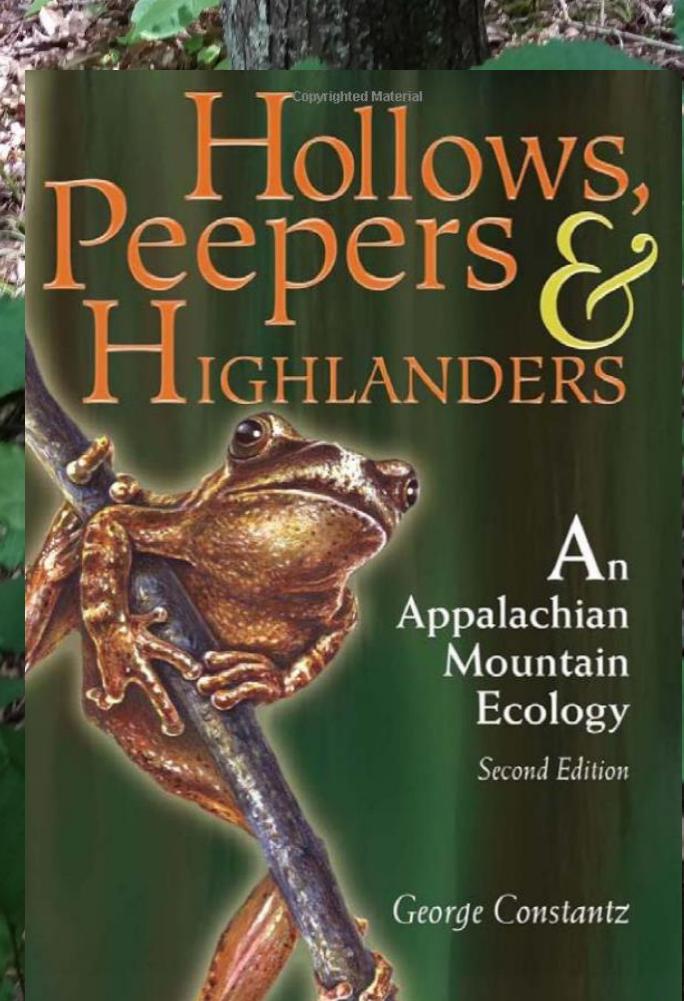
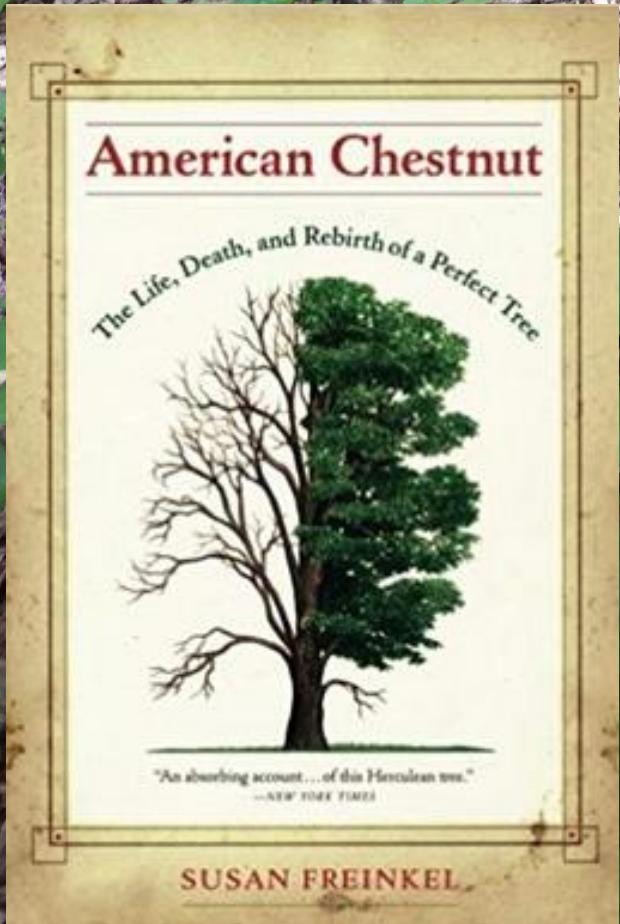
...motivated by the story of the American chestnut

# Methods of instruction

- Readings
- Lectures
- Class discussions
- Activities and labs
- Homework assignments
- Overnight field trip
- Work in teams to create an educational video/media product for TACF that communicates some aspect of chestnut ecology and restoration to a broad audience.

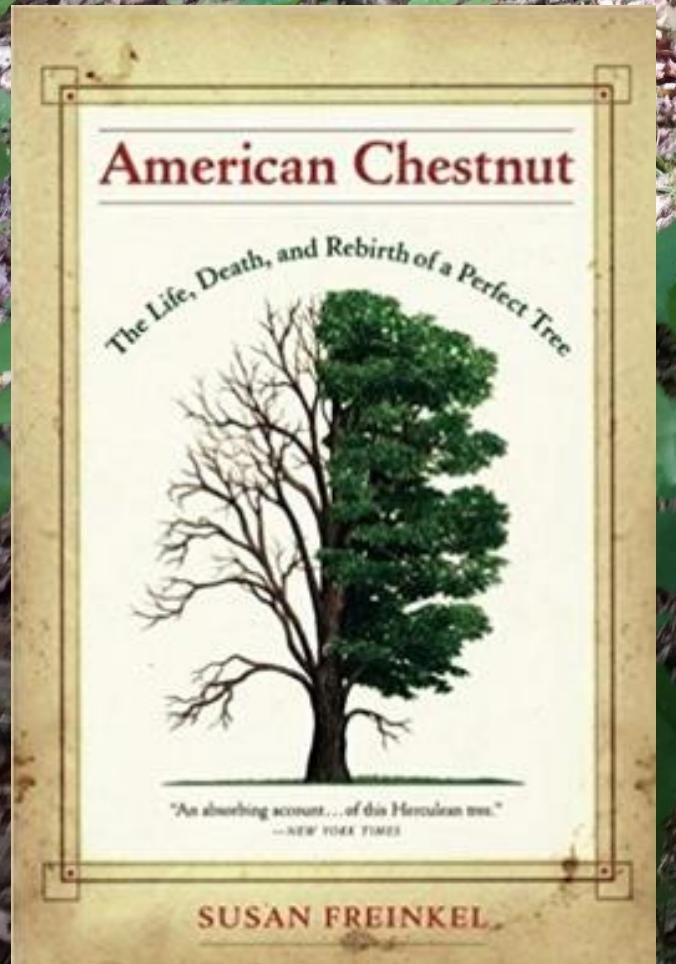
...motivated by the story of the American chestnut

# HON 317: “Textbooks”



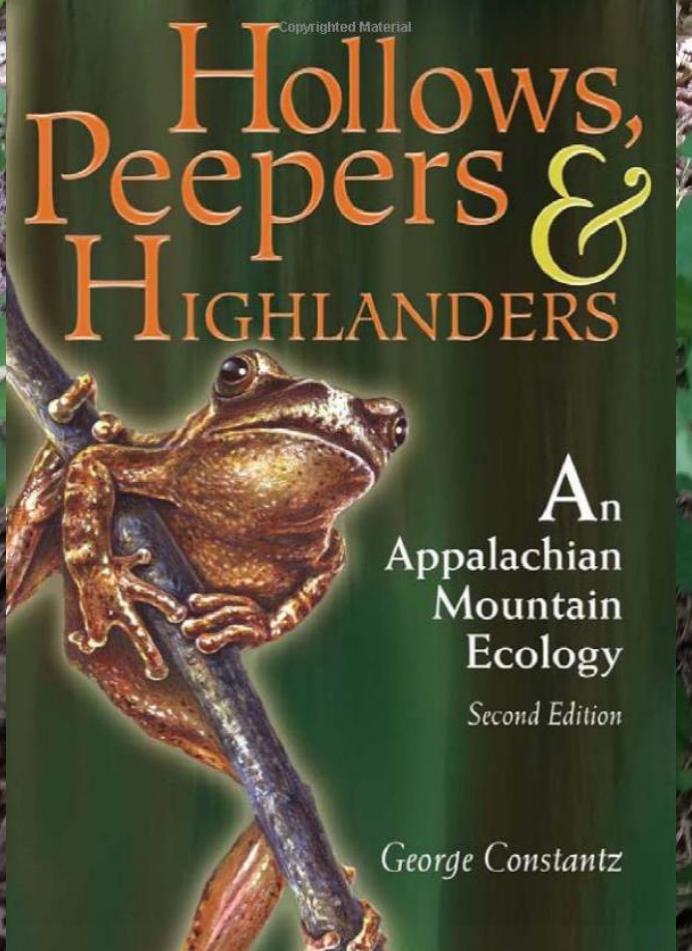
- Both affordable & accessible texts compared to traditional science textbooks
- Supplemented with online materials, including videos
- Reading assignments always accompanied by questions for students to answer as they read along

# HON 317: “Textbooks”



- Importance of American chestnut in:
  - Appalachian culture
  - Appalachian ecology
- Effects of the blight
- History of the blight:
  - Discovery
  - Spread
  - (Failed) Efforts to stop it
- Formation of The American Chestnut Foundation
- Approaches to creating resistant trees for restoration

# HON 317: “Textbooks”



- Appalachian ecology and evolution
- “Stage and Theater” more about plants & geology
- “The Players” are mostly animals (!)
- References to (older) studies
  - Students read follow-up scientific papers in a “low-risk” setting
- May not use again
- Still a good book for a different class

## Contents

Thanks .....	vii
<u>1. Prologue</u> .....	1
Stage and Theater	
<u>2. Origins</u> .....	7
<u>3. Forest Design</u> .....	17
<u>4. Creating Diversity</u> .....	25
<u>5. Catastrophe and the Appalachian Quilt</u> .....	33
<u>6. Balds</u> .....	41
<u>7. The Asian Connection</u> .....	45
The Players	
<u>8. The Improbable Lady's-slipper</u> .....	51
<u>9. Sexual Decisions of Jack-in-the-Pulpit</u> .....	59
<u>10. Nuptial Gift of the Hangingfly</u> .....	67
<u>11. Femmes Fatales of Twilight</u> .....	73
<u>12. Small Fishes in Shallow Headwaters</u> .....	81
<u>13. Darter Daddies</u> .....	89
<u>14. To the Brook Trout, with Esteem</u> .....	95
<u>15. A Lungless Salamander Trilogy: Primer</u> .....	101
<u>16. A Lungless Salamander Trilogy: Coexistence</u> .....	109
<u>17. A Lungless Salamander Trilogy: Mimicry</u> .....	115
<u>18. Love Among the Frogs</u> .....	119
<u>19. Box Turtle's Independence</u> .....	127
<u>20. Copperhead's Year</u> .....	133
<u>21. Oaks and Squirrels</u> .....	143
<u>22. Highlanders</u> .....	151

# HON 317: How scientists communicate

## Scientific Literature

### 1. Introduction

- Background/ Setting/ Problem (“*WHY*”)
- Literature Review (“*WHAT ELSE*”)
  - Summary of previous relevant research
  - Previous hypotheses, methods of testing
  - Setting current research in context of previous science
- Statement of Research Question

### 2. Methods- (“*HOW*”)

### 3. Results (“*WHAT*”)

### 4. Discussion

- Conclusions/ Implications (“*SO WHAT*”)

The background image shows a lush forest floor. In the center, there is a large, prominent leafy plant with deeply lobed, serrated leaves, likely a fern or a similar leafy ground cover. The ground is covered with a thick layer of fallen, brownish-yellow leaves. Several tree trunks are visible in the background, one of which is very close to the camera. The overall scene is a natural, undisturbed woodland area.

# HON 317: Evolution of species module

# What is a species?

- Controversial among evolutionary biologists
- Several concepts:
  - Biological species concept
  - Evolutionary lineage concept
  - Ecological species concept
  - General lineage concept

Yawn... for implementation of Endangered Species Act

# HON 317: Evolution of species case study

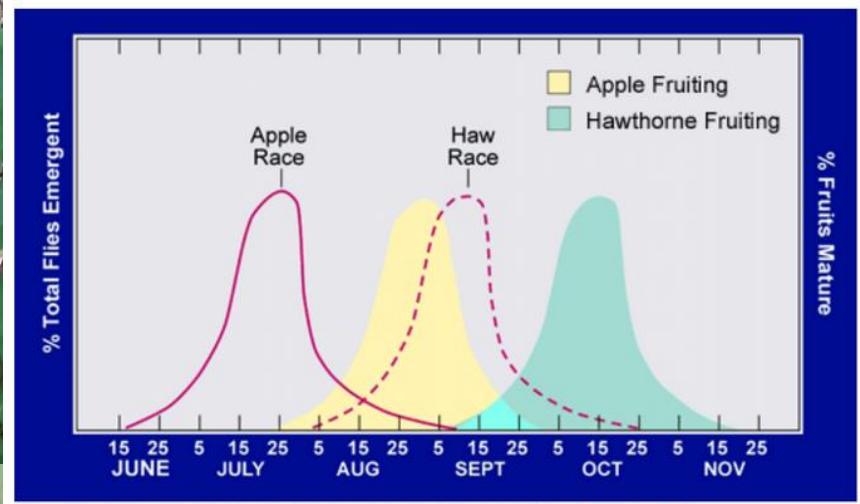


Figure 6: Emergence of *Rhagoletis pomonella* (adapted from Bush, 1969)

- Content about speciation and species concepts, then homework questions about those concepts
- In class, have students work together with the material from the case study
- Have the class debate whether they are separate species AND WHY or WHY NOT

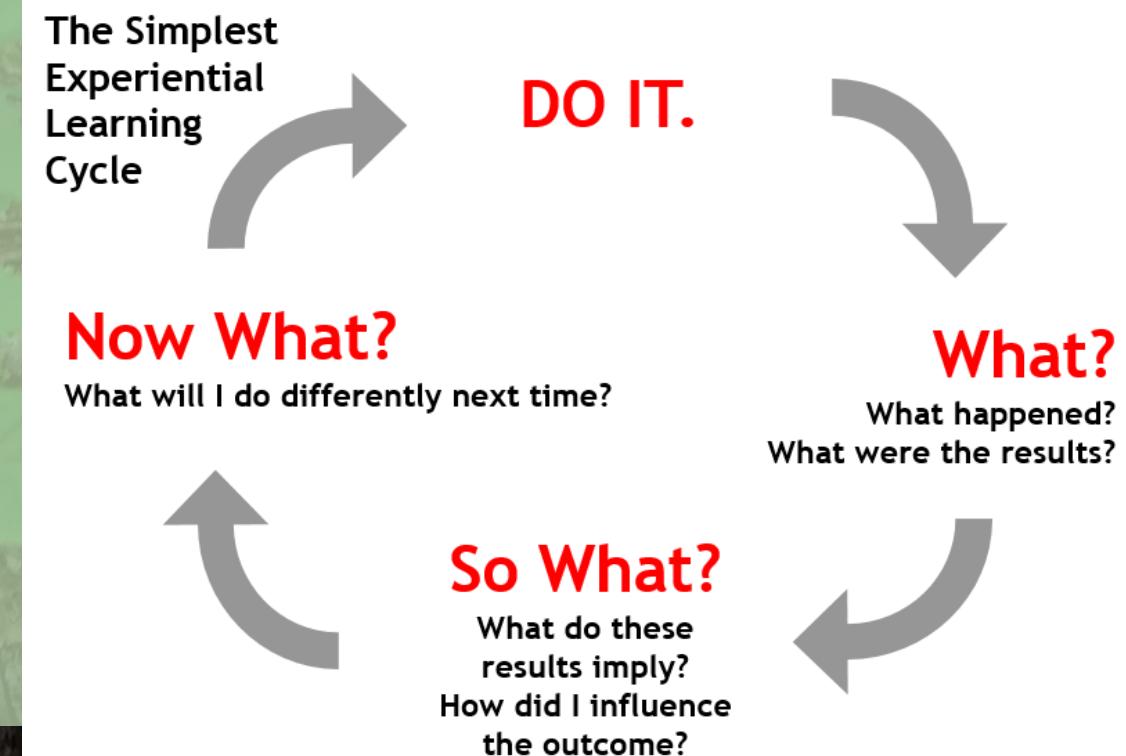


Figure 1: Apple maggot flies (male—left, female—right)

3. Would apple maggot flies and hawthorn maggot flies be considered two different species according to the biological species concept? Why or why not?

# HON 317: Reflection, or...

- How to get people to integrate:
  - Experiences with content
  - Content with previous knowledge
  - Content or experience with values
- Rooted in David Kolb's Experiential Learning Cycle
- Assignments with prompts



compiled by Andrea Corney  
[www.edbatista.com/2007/10/experiential.html](http://www.edbatista.com/2007/10/experiential.html)

# HON 317: Evolution of species case study

1. Briefly DESCRIBE what you learned about speciation from the case study.
2. Based on what you know of the plans of the American Chestnut Foundation to re-introduce backcrossed American and Chinese chestnuts, would you consider the resulting trees to be American chestnuts or a new species? Please EXPLAIN/defend your answer using what you learned through the maggot fly case study and what you know of the mechanisms of speciation.
3. ARTICULATE LEARNING: Think about the final project of communicating scientific information to the public. If you were to make a short educational video about issues of speciation related to the plans of the American Chestnut Foundation's backcross breeding program,
  - Who would be your INTENDED AUDIENCE,
  - What would be the “BOTTOM LINE” or main purpose of your message?
  - What would be the main IMPLICATIONS you would want to communicate to your audience
  - What would be your main two or three relevant scientific SUPPORTING DETAILS?

# HON 317: Class interactions with local TACF expert Rex Mann

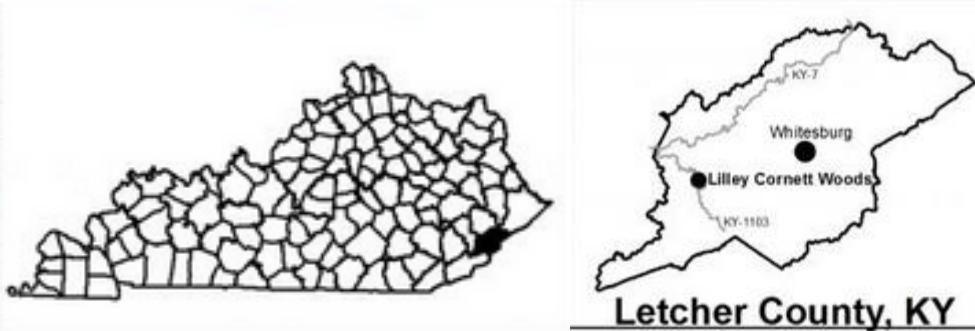
- A “real person” can engage students
- Visited classroom about a month into the semester
- Influenced student choices for their target audience for their video projects



# Field trip to Lilley Cornett Woods



- 252 acre EKU-managed mixed mesophytic forest
- Hike through old-growth forest
- See American chestnut re-sprouts
- Measure trees in established plots



# Visit to Letcher County Extension Office



- One large pure American chestnut there that only recently got the blight (after producing several offspring of its own)
- It was a **BIG DEAL** for the students to see after “all this talk”
- One student called her Papi

# Prepare for and participate in Arbor Day planting



# Prepare for and participate in Arbor Day planting

Sometimes visual references are essential for communication

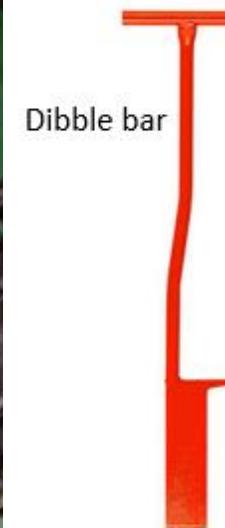
## Tool types



Hand trowel



Long-handled shovel



Dibble bar

Spade shovel or Post-hole shovel

# HON 317: Communicating science to the public

- Communicating to engage:  
<https://www.aaas.org/resources/communication-toolkit>
- “What is your communication goal?”
  - Identify appropriate audience(s)
  - Identify words or messages to engage audience with key ideas
  - Can be applied across communication channels, audiences, and goals



# HON 317: Scientific communication



Communicating to engage: <https://www.aaas.org/resources/communication-toolkit>



Adapted from Nancy Baron's *Escape from the Ivory Tower* AAAS Center for Public Engagement with Science & Technology

SCIENTISTS AND THE PUBLIC HAVE DIFFERENT COMMUNICATION STYLES. WHILE SCIENTISTS OFTEN START BY PLACING RESEARCH IN A HISTORICAL CONTEXT, THE PUBLIC WANTS TO KNOW THE KEY POINT AT THE START. ADAPTED FROM NANCY BARON'S *ESCAPE FROM THE IVORY TOWER*.

Public education videos



**Chestnuts and Change**  
*presents*  
**5 Student-made films**  
focused on  
**American Chestnut  
Education and Outreach**

**May 1st** 3:30-5:30  
in the **Science Building** room **3101**

Light refreshments will be  
provided

# Public education videos

# EKU Chestnut History



# EKU Save the Trees Cartoon Timeline

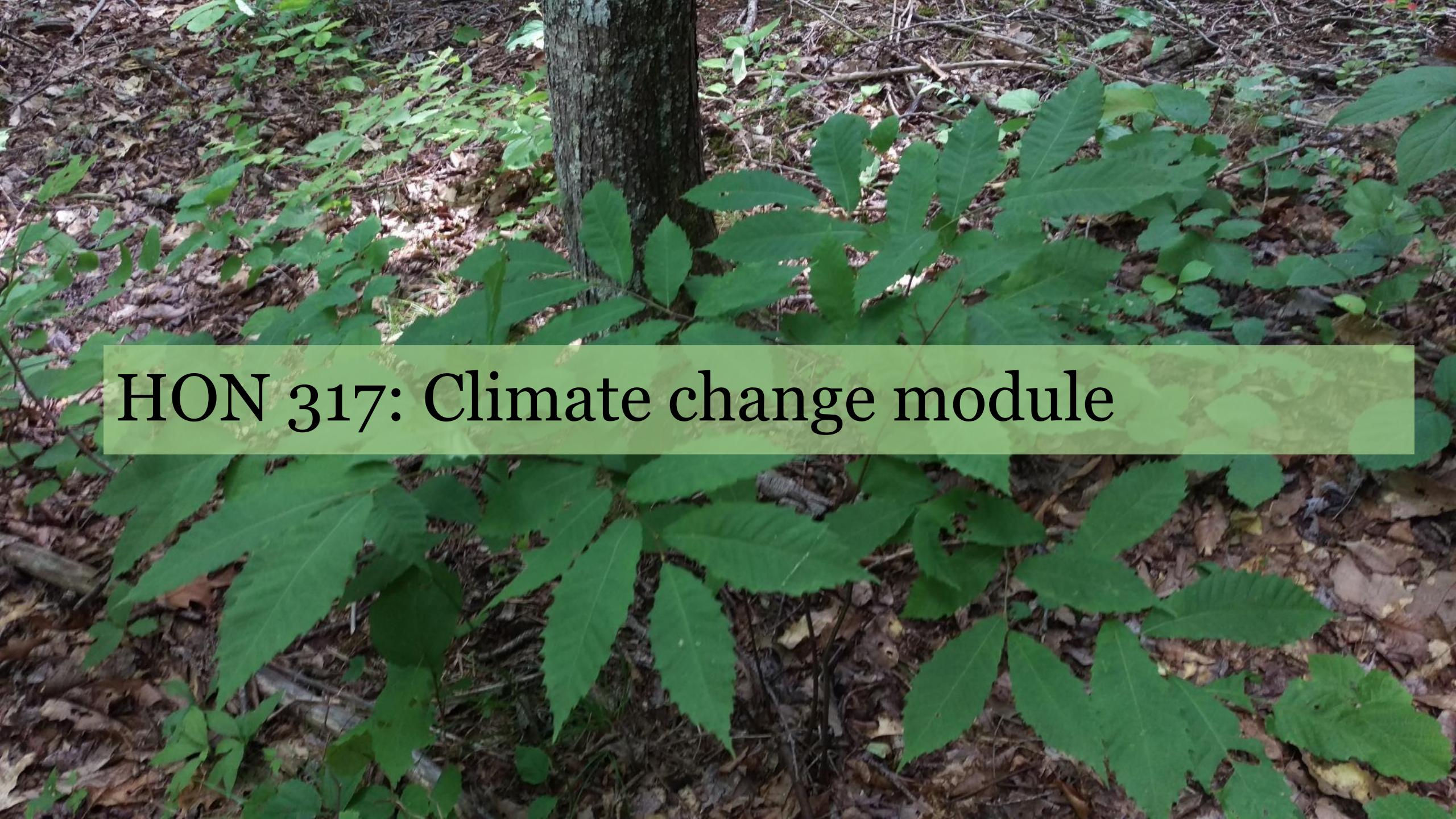


# Acknowledgements

- Dr. Alice Jones
- Dr. David Coleman and EKU Honors College
- Dr. Tom Saielli
- Rex Mann
- Dr. Bill Martin
- Rob Watts, Curtis Cox, and Karen Pratt from EKU Division of Natural Areas
- EKU Facilities Services
- KY-TACF: Amos Stone, Rick Caldwell
- EKU Office of Sustainability
- TreeCampus USA

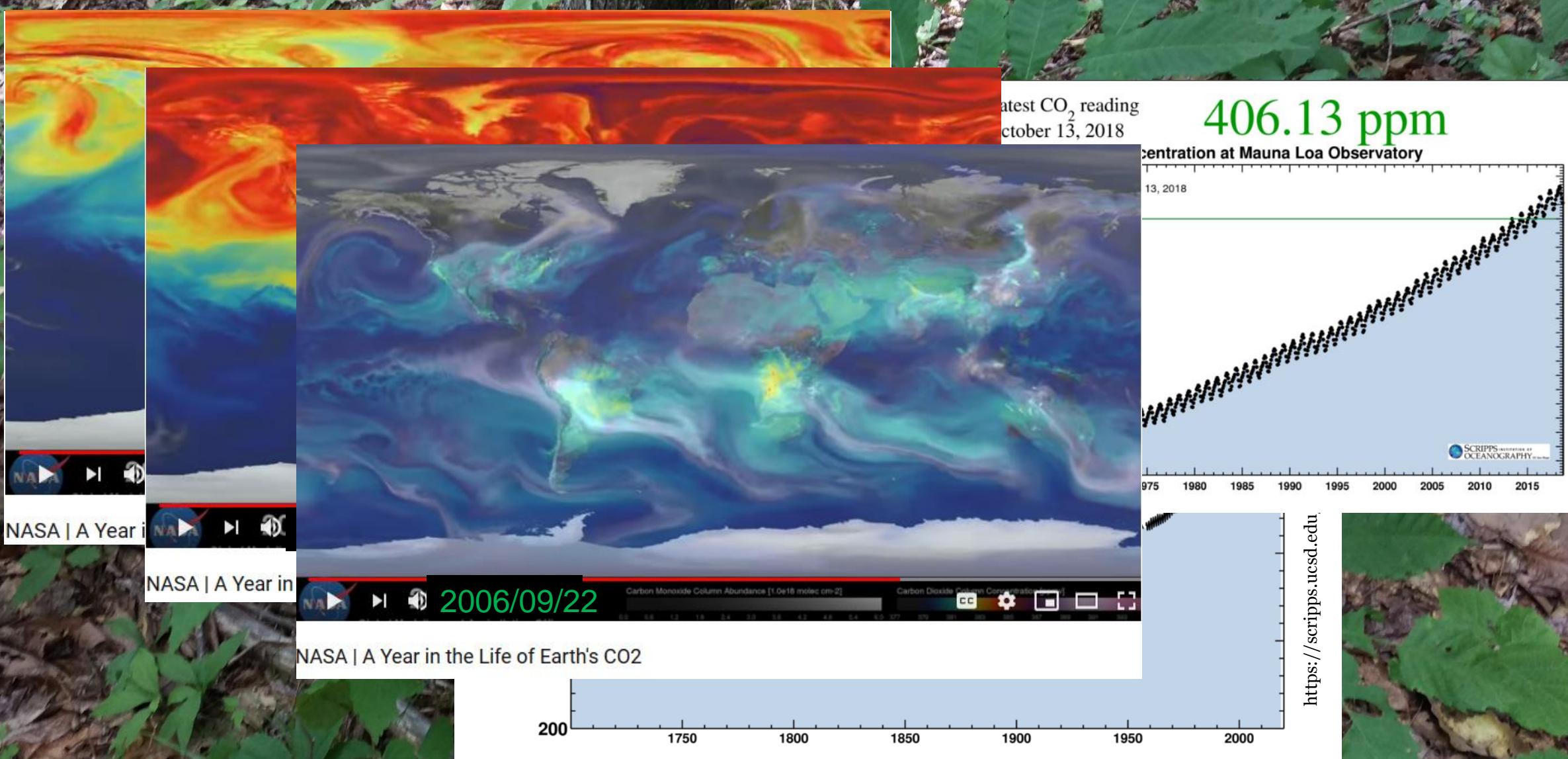
# GENERAL EDUCATION GOALS FOR ELEMENT 4 (NATURAL SCIENCE) COURSES

- After completing the General Education Program at EKU, students will be able to:
- Use appropriate methods of critical thinking and quantitative reasoning to examine issues and to identify solutions. (GE Goal two)
- Analyze the fundamental natural processes of the world and the interactions of humans and their environment. (GE Goal five)
- Distinguish the methods that underlie the search for knowledge in the arts, humanities, natural sciences, history, and social and behavioral sciences. (GE Goal seven)
- Integrate knowledge that will deepen their understanding of, and will inform their own choices about, issues of personal and public importance. (GE Goal eight)

A photograph of a forest floor. The ground is covered with a mix of large, healthy green leaves from various trees and shrubs, and numerous fallen brown leaves, indicating a natural cycle or perhaps some seasonal change. A few tree trunks are visible, one prominent one in the center-left and others partially hidden by the foliage. The lighting suggests a shaded, wooded environment.

# HON 317: Climate change module

# HON 317: Carbon cycling



# HON 317: Carbon cycling



MyTree v1.2

Tell us about your tree

Address  
646 University Dr, Richmon

Name  
Provide an optional name o

Tree Species  
Chestnut, Chine

Tree Condition  
Select a Condition

Trunk Measurement (in)  
Di

Sun Exposure  
Select Sun Exposure

Is there a building nearby?  
 ?

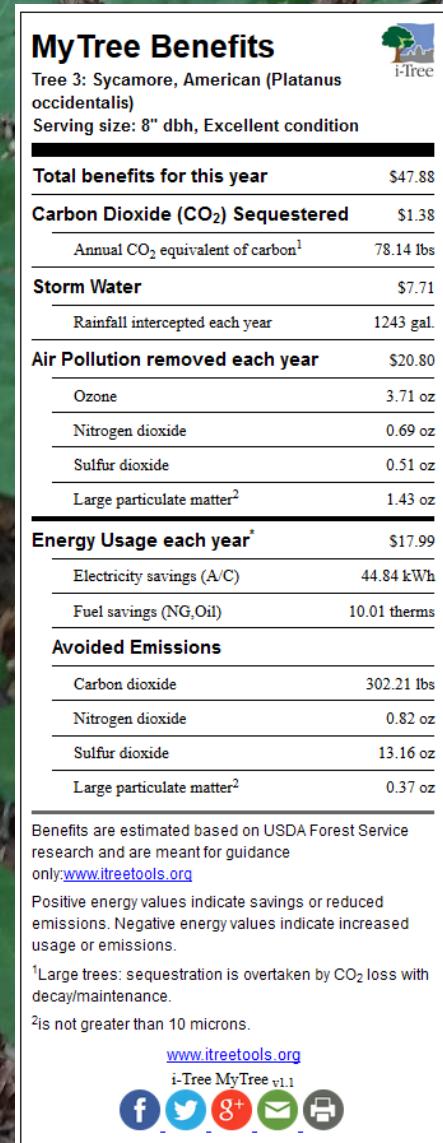
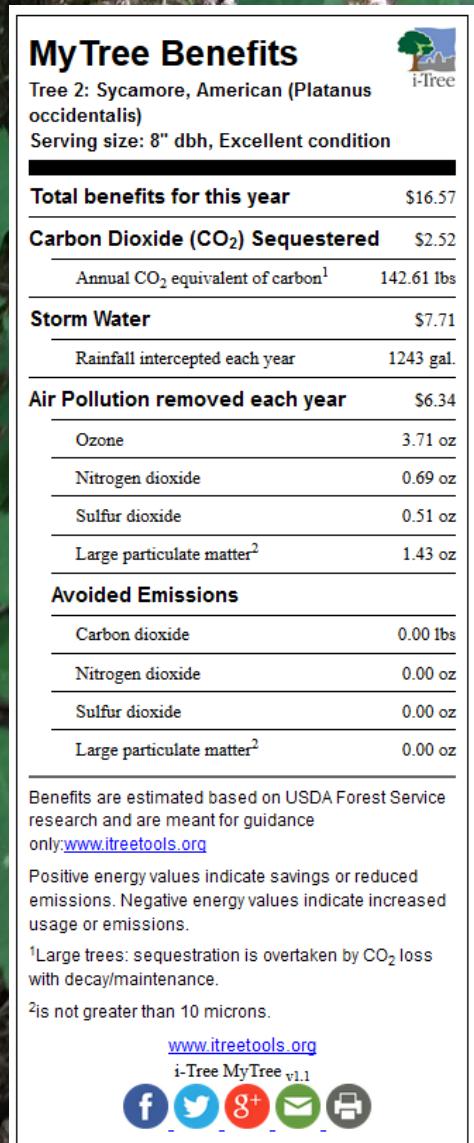
When was the building built?  
Select Building Vintage  
? ?

How far is the tree from the building?  
Select a Distance  
? ?

Estimate the compass direction from the tree to the building.  
Select a Direction  
? ?

Back Finish

Next



Less sunlight, but next to a building