

Lesson Plan: Wild Strawberry Fruiting and Climate Change

Teacher-contributed lesson plan by Dr Neeti Mehla, Dr Amit Vashishtha and Dr Aditi Kothari Chhajer, Sri Venkateswara College (University of Delhi), India.

As a **high school Biological Sciences** teacher, you can use this set of computer-based tools to teach **phenology** and **phenological events** like fruit production.

This lesson plan enables students to understand phenology and phenological events in plants. Environmental factors such as precipitation patterns, photoperiod, and temperature affect the timing of the first blooms and fruit setting for the formation of fruit. This lesson plan shows the relationship between climate and phenological events using the example of the timing of fruit production in wild strawberries.

Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in the Biological Sciences.

Use this lesson plan to help your students find answers to:

- What is phenology?
- What are phenophases?
- How do various environmental factors affect the timing of fruit production in plants?
- Do changes in the timing of fruit production affect the overall yield of fruit crops?
- How do phenological variations affect the food chain in an ecosystem?
- What is the impact of climate change on plant phenology?

About the Lesson Plan

Grade Level: High School

Discipline: Biological Sciences

Topic(s) in Discipline: Plant Phenology, Phenophase, Phenological Variations, Timing of Fruit Production, Length of Fruit Production, Precipitation Patterns, Photoperiod

Climate Topic: Climate and the Biosphere

Location: North America, USA, New England

Access: Online, Offline

Language(s): English

Approximate Time Required: 50 mins

1 Contents

1. Video and associated reading (20 min)

A short video to introduce phenology and an associated reading to briefly describe the history of phenological studies, its significance in living ecosystems and how climate change affects plant phenology.

This can be accessed at:

<https://budburst.org/phenology-defined>

2. Classroom Activity (30 min)

A classroom activity to explore data on the timing of fruit production and length of fruiting in wild strawberries plants over successive years.

This can be obtained at:

<https://extension.umaine.edu/signs-of-the-seasons/wp-content/uploads/sites/6/2014/09/Strawberry-Bloom-SA.pdf>

3. Suggested questions/assignments for learning evaluation

- What is phenology?
- What are phenophases?
- How do various environmental factors affect the timing of fruit production in plants?
- Do changes in the timing of fruit production affect the overall yield of fruit crops?
- How do phenological variations affect the food chain in an ecosystem?
- What is the impact of climate change on plant phenology?

2 Step-by-step User Guide

Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.

1. Topic introduction and discussion

Play the video, '[The Stories Plants Tell: The Science of Phenology](#)', by ProjectBudburst to introduce phenology and factors influencing phenology in plants. Use the associated reading, '[About Phenology](#)', to discuss phenology in plants in detail, including topics such as what are phenophases and the influence of environmental factors like light, temperature, humidity, and length of day on plant phenology. Use the reading to also describe some phenological studies that showed a link between climate and phenology. Stress on how phenological changes in different species could be indicative of climate induced environmental change.

The video and associated reading can be accessed at:

<https://budburst.org/index.php/phenology-defined>

2. Explore further using a dataset

Use this classroom activity, '[The Timing of Fruit Production in Wild Strawberry Plants](#)', by Elissa Koskela and Dr Molly Schaufler, University of Maine, to explore a phenology dataset on the timing and length of wild strawberry production in northern New England, USA. Using the data provided on page 1, have your students create graphs that compares strawberry production over 4 consecutive years. Then, use the questions posed in the activity sheet to enable students to understand the differences observed in fruit production in different years. Discuss the implications of such differences in the context of a changing environment due to climate change.

This worksheet can be obtained at:

[https://extension.umaine.edu/signs-of-the-seasons/wp-content/uploads/sites/6/2014/09/Strawberry-Bloom -SA.pdf](https://extension.umaine.edu/signs-of-the-seasons/wp-content/uploads/sites/6/2014/09/Strawberry-Bloom-SA.pdf)

3. Questions/Assignments

Use the tools and the concepts learned so far to discuss and determine answers to the following questions:

- What is phenology?
- What are phenophases?
- How do various environmental factors affect the timing of fruit production in plants?
- Do changes in the timing of fruit production affect the overall yield of fruit crops?

- How do phenological variations affect the food chain in an ecosystem?
- What is the impact of climate change on plant phenology?

3 Learning Outcomes

The tools in this lesson plan will enable students to:

- define phenology and phenophase in plants
- explain how environmental factors affect the change in timings of fruit production
- discuss the effect of altered phenology on the productivity of fruit crops
- discuss the impact of climate change on phenology

4 Additional Resources

If you or your students would like to explore the topic further, these additional resources will be useful.

1. Reading

A reading, 'Phenology as an Indicator of Environmental Variation and Climate Change Impacts' by the National Phenology Network, USA, to understand the importance of phenological observations in climate change.

This can be accessed at:

<https://www.usanpn.org/files/shared/files/phenology%20as%20an%20indicator%20of%20Environmental%20Variation%20and%20Climate%20change.pdf>

2. Reading

A research paper, 'Impact of climate change on the timing of strawberry phenological processes in the Baltic States', by Liga Bethere, Tija Sile, Juris Sennikovs and Uldis Bethers, University of Latvia, to understand the phenological changes in strawberry plants using Regional Climate Models.

This can be accessed at:

http://www.kirj.ee/public/Estonian_Journal_of_Earth_Sciences/2016/issue_1/earth-2016-1-48-59.pdf

5 Credits/Copyrights

All the teaching tools in our collated list are owned by the corresponding creators/authors/organizations as listed on their websites. Please view the individual copyright and ownership details for each tool by following the individual links provided.

We have selected and analyzed the tools that align with the overall objective of our project and have provided the corresponding links. We do not claim ownership of or responsibility/liability for any of the listed tools.

1. Video and associated reading; “About Phenology”

Developed by [ProjectBudBurst](#), a project by the Chicago Botanic Garden.

2. Classroom/Laboratory Activity; “The Timing of Fruit Production in Wild Strawberry Plants”

Authored by Elissa Koskela (University of Maine Cooperative Extension) and Dr Molly Schauffler (University of Maine Climate Change Institute and RiSE Center). Made available by the [Signs of the Seasons: A New England Phenology Program](#) by [University of Maine Cooperative Extension](#).

3. Additional Resources

“Phenology as an Indicator of Environmental Variation and Climate Change Impacts” by the [National Phenology Network](#), USA;

“Impact of climate change on the timing of strawberry phenological processes in the Baltic States” by Liga Bethere, Tija Sile, Juris Sennikovs and Uldis Bethers, University of Latvia. *Estonian Journal of Earth Sciences*, 2016, 65, 1, 48–58; [Estonian Academy Publishers](#).