

Basic Phenology Observations



Grade Levels

6-8

Overview

The following activity is meant as an introduction to phenology, the study of recurring plant and animal life cycle stages. Students make scientific observations of plants and record their observations.

Background

The Udall Foundation's Parks in Focus program (www.pif.udall.gov/), designed to connect underserved youth to nature through photography, began collaboration with the Boys & Girls clubs of Tucson in January of 2011. This Community development initiative consisted of a year-round environment education program for the Boys & Girls Clubs of Tucson, including 6 classroom-style lessons, one of which was focused on phenology. Parks in Focus requested to collaborate with the USA National Phenology Network (www.usanpn.org) on this particular lesson. The activity incorporates phenology monitoring protocols from the USA-NPN phenology observation program, *Nature's Notebook* (<http://www.usanpn.org/participate/observe>). These lessons were presented at six clubhouses in Tucson from January to April of 2011.

Real-world Connection

Students learn about seasonal changes and how those changes affect plants and animals, potential mismatch in plant and animal interactions, and how to collect data that is useful to scientists and resource managers.

Citizen Science Connection

Nature's Notebook is not critical to completing the activity, rather can be used as an addendum to the activity.

Time Required/Location

2 hours

Need an outdoor space with plants on which to make observations.

Learning Objectives

Participants will be able to:

- Understand the importance of seasons to plants and animals
- Define phenology
- Learn about local plants
- Make scientific observations on plants, using *Nature's Notebook*
- Record scientific observations of plants onto *Nature's Notebook* datasheets
- Take photos of different phenophases of plants observed (optional)
- Present information learned in a poster format for display at school or clubhouse

Next Generation Science Standards

LS: Life Science			
Grades 6-8		Grades 9-12	
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	HS-LS2-6	Evaluate the claims, evidence, and reasoning that interactions in ecosystems are consistent in stable conditions, but (changing conditions may result in a new ecosystem). ¹
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	HS-LS2-7	Design, evaluate, refine a solution for reducing impacts of human activities on the environment and biodiversity. ¹
MS-LS4-4	Construct an explanation based on evidence that described how genetic variations of traits in a population increase some individuals probability of surviving and reproducing in a specific environment.	HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
ESS: Earth and Space Systems			
MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact the Earth's systems.	HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.		

¹ Can be elicited through the Explaining and Elaborating portion of the activity.

Conducting the Activity

Materials

Resources needed, depending upon the way you choose to present the activity:

- Photos of seasonal changes in a deciduous tree or other plant
- *Nature's Notebook* datasheets
- Materials for posters-poster board, pens, paints, etc.
- Camera and photo printing capabilities (optional)
- *Phenology and Nature's Shifting Rhythms* by Regina Brinker - <http://ed.ted.com/lessons/phenology-and-nature-s-shifting-rhythms-regina-brinker>
- *Phenology* by Nina Leopold-Bradley - <http://climatewisconsin.org/story/phenology>

Conducting the Activity

Experience

ENGAGE

Ask students what each season here in Arizona means to them.

Introduction to Seasonal Changes (10 min):

- Show a series of photos of a deciduous tree in different seasons. Talk about the differences between seasons in terms of weather, amount of rainfall, sun, etc.
- Questions to use for discussion:
 - What do changing seasons mean for plants?
 - Why does the tree shed its leaves in the fall?
 - Why does it have flowers in the spring?
 - What do the flowers need to turn into seeds?
 - What do changing seasons mean for insects?
 - During what seasons would you see a leaf-eating insect on this tree?
 - What do changing seasons mean for birds?
 - During what seasons would you see a bird at this tree? (feeding on insects, eating berries, nesting)
- Summarize by talking about how the phenological events of plants and animals are related.

Introduction to Phenology (10 min):

- All of the seasonal changes you talked about above are phenological events
- Pheno-to show or appear
- ology-to study
- Phenology- the science of recurring plant and animal life cycle stages
- What are some more examples you can think of? (migration, breeding, green-up, senescence)

Explore

EXPLAIN

Inside Activity: The *oak tree*, the *caterpillar* and the *flycatcher* (15 min):
Objective: Understand why phenology is important.

Have students help to act out the following story of phenological mismatch. In a typical year, the European pied flycatcher spends its winter in Africa, and relies on the angle of the sun to know when to fly north to its summer grounds in Europe. In Europe, oak trees are leafing out, and caterpillars are abundant. The flycatcher relies on this caterpillar food source after its long journey. However, in recent years, with warming temperatures, the oak tree is leafing out early, and the caterpillar is abundant earlier as well. But the flycatcher is still depending on the same sun angle to know when to migrate. By the time the flycatcher arrives in Europe after its long migration, the caterpillars are no longer available as a food resource for the flycatchers.

Show the videos, *Phenology and Nature's Shifting Rhythms* by Regina Brinker and *Phenology* by Nina Leopold-Bradley.

Have one student act as the oak tree, one as the caterpillar, one as the flycatcher and one as the sun. Students can raise their arms like branches of a tree, make feeding motions like caterpillars or birds. You tell the story as the students act it out, showing a typical year first and then a warmer year where there is mismatch.

*Depending upon the grade level, you can instead have students create their own story or skit about a potential mismatch.

Outside Activity: Phenological Observations (40 min):

Objective: Practice making scientific observations and entering information on datasheets.

1. Go to a nearby park, garden or open space that has some plants on the *Nature's Notebook* plant list www.usanpn.org/nn/species_search (scope this out beforehand so you can get the information you need from our website)
2. Have prepared a list of interesting facts about each plant-their uses to people or animals, how long they live, anything interesting about their natural history to get the students interested in the plants.
3. Go through the phenophases of these plants (located on our webpage). How does this plant reproduce? Does it have flowers or seeds? Does it have leaves in winter? (this can be done in small groups, rotating around so that each group gets to make observations on each plant.
4. Record your observations on our datasheets (available on www.nn.usanpn.org)

NOTES ON ACTIVITY