Signs of the Seasons: A Maine Phenology Project

http://umaine.edu/signs-of-the-seasons/

Plant and Animal Life Cycle Drawings

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Grade level: 4-12
Themes: Phenology, animal and plant life cycles and life history
Activity type: Field observation and drawing
Setting: Classroom or outdoors

QUESTIONS
When do different plant or animal species go through their different life cycle stages in my community?
How do the species overlap in their timing?
If some species are dependent on other species, is the timing suited for their survival?

OVERVIEW
Instead of the traditional circle-shaped life cycle drawings that you see in many books, this activity shows you a way to have your group/class use their species observations to draw a life cycle for one or more of *Signs of the Seasons (SOS)* species. For this exercise, the drawing is stretched out in a line and matched to the dates on a calendar year. (If you aren't able to observe all phenophases, you can estimate, based on guidebook information).

Students use *SOS* phenology observation protocols and data sheets to monitor plants or animals on their school grounds or in a local park. They use their recorded data to develop a timeline of species' phenophases. Students learn field observation and data collection skills. They learn to look for patterns and relationships in and among species. They are encouraged to hypothesize and infer meaning from their observations and they have the opportunity to share what they learn by giving presentations at school.

EDUCATION STANDARDS

Maine Learning Results (*Science and Technology)*

A1 Unifying Themes – Systems

3-5. Students explain interactions between parts that make up whole man-made and natural things.

6-8. Students describe and apply principles of systems in man-made things, natural things, and processes.

9-Diploma. Students apply an understanding of systems to explain and analyze man-made and natural phenomena.

A3 Unifying Themes – Constancy and Change

3-5 a. Recognize patterns of change including steady, repetitive, irregular, or apparently unpredictable change.

6-8. Students describe how patterns of change vary in physical, biological, and technological systems.

B1 Skills and Traits of Scientific Inquiry

3-5 a. Pose investigable questions and seek answers from reliable sources of scientific information and from their own investigations.

6-8. Students plan, conduct, analyze data from, and communicate results of investigations, including simple experiments.

C1 The Scientific and Technological Enterprise – Understandings of Inquiry

3-5 a. Describe how scientists answer questions by developing explanations based on observations, evidence, and knowledge of the natural world.

9-diploma. Students describe key aspects of scientific investigations: that they are guided by scientific principles and knowledge, that they are performed to test ideas, and that they are communicated and defended publicly.

E2 The Living Environment – Ecosystems

3-5. Students describe ways organisms depend upon, interact within, and change the living and non-living environment as well as ways the environment affects organisms.

6-8. Students examine how the characteristics of the physical, non-living (abiotic) environment, the types and behaviors of living (biotic) organisms, and the flow of matter and energy affect organisms and the ecosystem of which they are part.

LEARNING OBJECTIVES

- Students learn about the life cycles and life history of local plant and animal species.
- Students learn about the timing of individual species' life stages.
- Students practice making observations in the field and collecting and recording data.
- Students gain experience collaborating and communicating with their peers towards a common goal.

Expectations and Misconceptions: It's important to mention to students that variability is normal in the natural world. If they do not see changes when they expect to, or among all individuals of the same species, they should be cautioned against leaping to conclusions. Encourage them to think carefully about what they have observed and consider as many explanations as possible.

MATERIALS

- *Signs of the Seasons* Field Guide and species list
- USA-National Phenology Network *Nature's Notebook* data sheets

Note: see Resources section below for links to these items on the Web

And, depending on what species will be monitored:

- Field kit materials as needed (flagging tape, plant markers, marker pen, hand lens, etc)
- Bird seed and feeders
- Identification guides
- Science notebooks
- Whiteboards
- Binoculars, digital camera
- Computer and internet connection

TIME NEEDED

--Two 30-40-minute class periods for class discussion and planning
--10-20 minutes, on a weekly basis, over an extended period of weeks or months to record data on datasheets in the field
--10-20 minutes to record observations in logbook after each outing
--30-40 minutes to plan and begin creating the timeline calendar
--Two 30-40-minute class periods to finalize the calendar and write up summary of any conclusions or findings
--One 30-40-minute class period for presentation(s) of findings and group discussion

ACTIVITY PROCEDURE (See the Resources section below for links to *SOS*/*NPN* websites and materials)

1. Visit the *Signs of the Seasons* website to get a copy of the *SOS* Field Guide, see the *SOS* species list, and learn how to sign up as an *SOS* phenology observer. http://umaine.edu/signs-of-the-seasons/
2. Decide which *SOS* species your group will observe.
3. Decide on when and how to collect the data. If you will be observing a number of different species, you may wish to assign small teams to keep track of 2 or 3 species each.
4. Follow the *SOS* protocols in the Field Guide for selecting a site and marking any individual plants you are observing; establish a schedule and system for making regular observations.
5. Ask students to establish a science notebook or journal to be used in the course of this project. Talk about basic information that should be included in a science-minded journal. This depends on the activities and research but might include things like dates, weather information, careful observations of species, phenophases, behavior, predictions and hypotheses, drawings, samples (pressed leaves or flowers) or notes about the process and any limitations.

6. Use *SOS*/USA-National Phenology Network (NPN) Data Sheets to record your observations. Establish a plan for logging your data into the NPN online database, *Nature's Notebook,* and make sure the data are added to the database. Instructions for how to do this can be found in the *SOS* Field Guide, and on the *Nature's Notebook* website.
7. When phenophase changes are observed, or when anything notable occurs, record these observations through notes and photographs and drawings. These could be used later to embellish your life cycle timeline/calendar.
8. Draw out a timeline on a large sheet of paper. Using your recorded notes, with dates of phenophases, establish the life cycle timeline of the species on your blank timeline. Students can paste photo prints and/or drawings of the phenophases onto the calendar in the appropriate places.
9. Guide the students in a discussion about what their field observations and investigations have turned up. What happened with respect to timing of phenophases? What do the findings tell them with respect to ecology and climate in their locale?
10. Make plans to present the life cycle drawings and the findings to other student groups. Help your students think about how to share their findings and discuss their experiences and observations.

REFLECTION/FORMATIVE ASSESSMENT IDEAS

Reflection: Ask participants to reflect on their field experience, the data collection system, and the preparation of the timeline. Reflect on what worked well and what they could do differently next time. Ask them to talk about any ways their expectations about the life cycle timing were or were not met. Can they speculate about possible reasons or causes?

Formative assessment: Collect the students' science notebooks or journals to see how well they recorded their observations and understood the process and the data they collected. Do they seem more comfortable with the process of making observations and collecting data in the field? Save examples of student work for reference the next time you try this activity.

EXTENSION IDEAS

Compare your life-cycle calendar to a historical phenology calendar (such as those Thoreau created), to see if you notice any differences. *[Note: SOS staff has copies of historical phenology calendars created by Henry David Thoreau and Aldo Leopold that they will be glad to share with you.]*

Also, consider what the calendar says about the species' needs and requirements. By doing this for more than one species, students can see how they overlap in their development. Talk about pairs of species that might be dependent on one another (monarch and milkweed, for example). Speculate on what might happen if the timing of one species' phenophases shifted to earlier or later. How could that affect the other species? Discuss as

a group possible changes in the environment that could cause (or may have already caused) that timing to shift.

RESOURCES
Signs of the Seasons (http://umaine.edu/signs-of-the-seasons/)
USA National Phenology Network (http://www.usanpn.org)

Getting set up with *Signs of the Seasons*:
SOS Field Guide (http://umaine.edu/signs-of-the-seasons/resources-for-observers/)
SOS Indicator Species (http://umaine.edu/signs-of-the-seasons/indicator-species/)
USA-NPN *Nature's Notebook* (https://www.usanpn.org/user?destination=MyNPN)

To get started, follow instructions in the Field Guide for selecting a site and choosing species and individual plants to observe. Then register an account with Nature's Notebook. Once you do that and enter your site(s) and species list, you'll be able to access the Data Sheets for downloading and printing. These can be used outdoors when recording your observations.

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