Signs of the Seasons: A Maine Phenology Project

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

Sister School: Phenology Calendar Exchange

Authors: Beth Bisson[1], Medea Steinman[2], and Esperanza Stancioff[2]

[1]Maine Sea Grant
[2]University of Maine Cooperative Extension

Grade level: 4-12
Themes: Phenology, climate change
Activity type: Hypothesizing and prediction, field observation and data collection, evidence-based thinking, peer-group collaboration
Setting: Classroom or outdoors

QUESTIONS
When do different plant or animal species go through their phenological stages in my community?
What do I expect to see for the same species at other locations in my state?
Does the timing vary between locations? What does our investigation tell us?
Can we explain our findings? What information can we use to explain what we found?

OVERVIEW
Students use *Signs of the Seasons (SOS)* phenology observation protocols and data sheets to monitor plants or animals on their school grounds or in a local park. They partner with another school or youth program in another region of Maine to compare findings. The groups select one or more common species for comparison, decide when and how often they will make observations, and set up a means of regular communication.

Students are encouraged to hypothesize and make predictions, infer meaning from the comparisons (e.g., with respect to climate change and ecological principles), engage in

speculation, and learn to articulate and support claims and conclusions. They have the opportunity to share what they learn by giving presentations at school. This can be used as a basis for classroom discussion in order to explore lines of inquiry and help students make meaning out of their observations.

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

- Participants learn about local and regional climate variability and ecological principles affecting species, i.e., that the timing of phenological events may vary according to geography, microclimate, or climate change.
- Students practice making predictions and collecting and interpreting information that supports or disproves their predictions.
- Students gain experience collaborating and communicating with partner “scientists” towards a common goal.

Expectations and Misconceptions: It's important to mention to students that they probably will not find changes in the timing of all events. They may not find changes in the timing of any events. The goal is to know which have changed, which haven't, and why.

Guard against the notion that, "If I see changes in timing, that's climate change. If I don't see them, then the climate is not changing." Remind them that the climate is changing, that some things are impacted more than others, and that things are impacted differently.

MATERIALS

- *Signs of the Seasons* Field Guide and species list
- 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, predictions and planning
--10-20 minutes, on a weekly basis, over an extended period of weeks or months
--10-20 minutes to record observations in logbook after each observation
--30-40 minutes (periodically) for online communication and comparing notes with partner team
--Two 30-40-minute class periods (or additional time as assigned homework) to 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.
2. Decide which *SOS* species your group will observe, and which ones will be observed in common with your Sister Team.
3. Decide on when and how to confer with your Sister Team about your investigation and findings. Decide together what research questions you will address (can be as

simple or complex as you wish) and plan when to "meet" (virtually) to discuss what you've found.

4. If you wish to communicate online, set-up an online forum for sharing information with your Sister Team. (There are a variety of free options including **Edmodo** [http://www.edmodo.com/], **Weebly** [http://www.weebly.com/], and **Google Sites** [http://www.google.com/sites/help/intl/en/overview.html]. All offer introductory videos. Edmodo offers in-depth webinars about things you can do with the software.)
5. 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. Make sure your sister school or group is using the same system so you can directly compare your data.
6. Ask students to establish a science notebook or journal to be used in the course of this (and other projects, if desired). 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, phases, behavior, predictions and hypotheses, drawings, samples (pressed leaves or flowers) or notes about process and limitations.
7. Ask the students to make predictions about what they expect to see at each location for each species, and write them down in science notebooks or journals.
8. Use *SOS*/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.
9. When phenophase changes are observed, or when anything notable occurs, post updates to your Sister Team forum and/or ask the students to record them in their science notebooks or project journals. Record any changes through notes and photographs and post those to the forum as well.
10. Guide the students in a discussion about what their field observations and investigations have turned up. Do their observations support their predictions? Why or why not? What happened with respect to timing of phenophases? What do the findings tell them with respect to ecology and climate in their locales and between their locales? Do they have enough information to draw conclusions with respect to general changes in plant or animal phenophases? If not, could they strengthen their study by comparing to other data records in the community?
11. If it seems feasible (geographically and financially), you can make plans to bring the two teams together to present their findings to each other and discuss their experiences and observations. Or, if you are far apart, you could arrange for the students to videotape a presentation of their findings and share the videos using a free, private Vimeo website (www.vimeo.com), or use Skype (http://www.skype.com/intl/en-us/homepage) to communicate virtually with one another.

12. If the findings are notable, consider presenting to another audience (such as a nature center or relevant state organization).

REFLECTION/FORMATIVE ASSESSMENT IDEAS

Reflection: Ask participants to describe their investigation and reflect on what worked well and what they could do differently next time. Ask them to talk about any ways their predictions were or were not supported. Can they speculate about possible reasons or causes? How much can they infer and what other evidence/information would they need to make any claims about causes?

Formative assessment: Collect the students' science notebooks or journals to see how well they recorded their initial predictions and the data they collected through their species observations. Were they able to make connections between what they saw and their original predictions? Do they understand the process of collecting evidence that either supports or does not support their predictions? Save examples of student work for reference next time you try this activity. Work that shows a range from solid understanding to common misconceptions is particularly helpful.

EXTENSION IDEAS

If they turned up interesting findings, offer guidance in preparing a presentation to a local nature center, library or in another public setting. Have the students build on the exercise by searching records or asking experts about how plant and animal phenology may have been different in each locale or between the two locales in the past. What inferences or conclusions can they draw about these changes and how can they support their claims?

RESOURCES

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

Communicating and collaborating with your Sister Team:

Free websites and wikis:
Edmodo (http://www.edmodo.com/)
Weebly (http://www.weebly.com/)
Google Sites (http://www.google.com/sites/help/intl/en/overview.html)

Free, private, online video-sharing:
Vimeo (http://www.vimeo.com)

Other:
Skype (http://www.skype.com/intl/en-us/homepage)

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.

Readings:

Phylogenetic patterns of species loss in Thoreau's woods are driven by climate change. (http://www.amjbot.org/content/93/11/1667.abstract).

For assistance contact:

Esperanza Stancioff, Climate Change Educator
University of Maine Cooperative Extension/Maine Sea Grant
(207) 832-0343; 1-800-244-2104; esp@maine.edu

Beth Bisson, Assistant Director for Outreach and Education
Maine Sea Grant College Program
207-581-1440; beth.bisson@maine.edu

Signs of the Seasons Partners