Signs of the Seasons: A Maine Phenology Project

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

Bird Feeder Notebook

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Grade level: 6-12
Themes: Phenology, climate change
Activity type: Field observation, online data inquiry, evidence-based thinking, and supporting claims with evidence
Setting: Classroom or outdoors

QUESTIONS
When do different bird species visit your community?
Is the timing of bird breeding or migration changing?
If you think so, how do you know? Can you find evidence to support your claim?

OVERVIEW
Students record observations and collect data about birds visiting feeder(s) outside their school. They compare their records with historical records from local birding experts and online citizen science data sources to determine whether the timing of bird activity has shifted in their community. They learn to make use of library and Internet-based citizen science resources to conduct research about the patterns of bird species activity in their area and how those may have shifted in response to changes in the timing of phenological events. Students also interact with local experts and conduct informal interviews.

Students are encouraged to infer meaning from the comparisons (e.g., with respect to climate change), engage in speculation, and learn to articulate and support claims and conclusions. Students' findings can be used as a basis for classroom discussion focused on

exploring lines of inquiry and making meaning out of their observations. Students may also share what they learn by giving presentations at school or in their community.

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.

E1 The Living Environment – Biodiversity

3-5. Students compare living things based on their behaviors, external features, and environmental needs.

6-8. Students differentiate among organisms based on biological characteristics and identify patterns of similarity.

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 understand that the timing of phenological events can change, particularly as a result of changes in climate
- Participants investigate how this may have affected bird species in their communities by engaging in field observation and data collection, and by supplementing their inquiry by investigating other sources of information.

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

- Access to historical records--either from local bird experts or online citizen science data (see resources below)
- Bird feeder and bird seed (for installation on school grounds, or nearby, with proper permission from land owner)
- Bird identification guides, and/or Internet access to online bird identification resources (see resources below)
- Blackboard, whiteboard, or flip charts for recording group discussion ideas
- Binoculars
- Optional: camera
- Science notebooks for recording predictions and bird observations

TIME NEEDED

--10-20 minutes, on a weekly basis, over an extended period of weeks or months
--Two 30-40-minute class periods (or additional time as needed) to collect information from other sources (interviewing bird experts or searching online databases)
--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

1. Prior to spring or fall migratory season, set up a bird feeder (or feeders) in a convenient place for your class/student group to make weekly observations of bird species visiting the feeders.
2. Organize a student datasheet and notebooks for consistent observations about which species are present, and particularly note when they are observed for the first and last time each year (e.g., at spring migration/breeding season or at fall migration). Useful data to record for each observation day may include:
    a. Species name
    b. Date
    c. Time of day (morning, afternoon, evening)
    d. Note precipitation and amount of snow cover, if any
    e. Observed activity (feeding, singing, nest material gathering, etc.)
    f. Gender, if known

g. First sighting of the year (Y/N)?
h. Last sighting of the year (Y/N)? *Note: may need to revisit this and make corrections.*

Encourage students to record other thoughts, observations, drawings in the other pages of their notebooks concerning bird activity, behavior and timing.

3. Prior to data collection, organize students into small groups (2 or 3 students per group, maximum). Discuss as a class the seasonal changes that affect the timing of bird migration (temperature, snowmelt, weather, availability of food, etc.). Make a list of these things on the blackboard or whiteboard.
4. Ask the students in each group to use bird identification guides and/or consult online resources to figure out which species are commonly seen in their community, and then ask the students to make predictions about which birds they might expect to find at their feeder (based on the type of food you're providing, surrounding habitat, time of year, etc.), and when they might start to arrive or disappear for the season. Ask the students to record their predictions in their science notebooks. *Note: see resource list below for good printed or online species identification guides that include this type of information.*
5. Start collecting data from the feeder! Try to make regular observations on a weekly schedule (or as often as you like) that gives each student at least one opportunity to make observations and record data for the group.
6. Once the students have collected their own data for a period of weeks or months, help them identify local birding experts who have been keeping similar records for many years. *Note: see list of resources below.* Invite one or more of them to visit the class or arrange to go and visit them at their bird watching site, and share your data with each other for comparison. See if you can spot any differences in the dates or species appearing at your feeders. Dates of first or last appearances may be particularly interesting.
7. Also, or in case no local bird experts can be found, visit Cornell Lab of Ornithology citizen science databases to obtain similar information for your area. Programs like e-Bird and Project Feederwatch have amassed tremendous amounts of data and it's likely that local birdwatchers from your area have participated and added to one of these databases (see Resources below).
8. 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? Offer guidance in preparing their own and experts' data for presentation. For example, help them decide how or whether to present the data visually (what type of graph to make, based on the data they've collected – time series vs. comparison of two groups, etc.).
9. When the presentations occur, make sure there is ample time for questions, discussion, and reflection.

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 changes that have occurred in the timing of bird activity. Can they speculate about possible climate-related causes for these changes? How much can they infer and what other evidence/information would they need to make any claims about climate change causes? Specific questions that may help prompt the discussion include:

a. Did they see differences between their own data and those collected by experts? If so, would they make changes in which types of data students should collect in subsequent years or seasons?

b. Is the information they have collected (their own or from other sources) enough to make any kind of statement about changes in bird migration or other phenophases over time or space? If not, what further information (or time series of data) would they need to back up this sort of claim? How could/would students conducting this sort of survey over many years organize and analyze their data to answer this kind of question?

Formative assessment: Ask student groups to give weekly updates at the beginning of class about their inquiry, including all aspects (feeder watching, species noted, search for experts, reviewing online databases). Ask them to comment about any problems or questions they've encountered. Do they feel the information they're collecting will help then to draw conclusions about their original claims or predictions. Notice where they might benefit from your coaching about thinking about their observations, questions for experts, or in how to find appropriate data and make sense of it?

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 species that used to appear locally and no longer do, or species that were not seen in the area until recently. 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)

Species identification:

There are countless field guides in book form. Peterson's, National Geographic or Sibley's guides are all good. For online sources try:
Whatbird.com (http://identify.whatbird.com/mwg/_/0/attrs.aspx)
eNature (http://www.enature.com/fieldguides/intermediate.asp?curGroupID=1)
USGS Patuxent Bird ID Info Center (http://www.mbr-pwrc.usgs.gov/id/framlst/framlst.html)

Bird Watcher's Digest
(http://www.birdwatchersdigest.com/bwdsite/learn/identification/index.php)

Finding bird experts in your community:
Maine Audubon Centers and Chapters
(http://www.maineaudubon.org/explore/centers/index.shtml) and
(http://www.maineaudubon.org/about/chapters.shtml)

Online data about bird observations (nation-wide):
e-Bird (http://ebird.org/content/ebird/about)
Project Feederwatch (http://www.birds.cornell.edu/pfw/)
Great Backyard Birdcount (http://www.birdsource.org/gbbc/whycount.html)
USGS North American Bird Phenology Program (http://www.pwrc.usgs.gov/bpp/#)

Readings:

Phylogenetic patterns of species loss in Thoreau's woods are driven by climate change.
(http://www.pnas.org/content/early/2008/10/24/0806446105.abstract).

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