



Ecosystem Phenology

learning objectives

subjects

English–Language Arts
Environmental Education
Science

WISCONSIN MODEL ACADEMIC STANDARDS

ENGLISH–LANGUAGE ARTS
C.8.3, E.8.1, F.8.1, F.12.1

ENVIRONMENTAL EDUCATION
A.8.1, A.8.2, A.8.4,
A.8.5, A.12.1

SCIENCE
A.12.1, C.8.2, C.8.3,
C.8.8, C.12.1, E.8.3,
E.8.5, F.12.8

materials

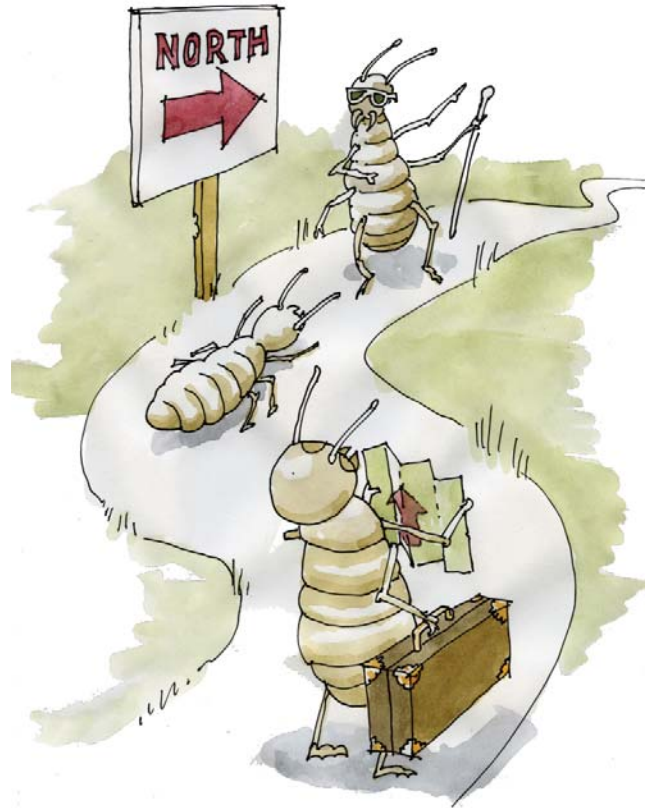
- Writing journals
- Worksheet included in this activity

Students will:

- Understand the methods of phenological data collection.
- Interpret and apply phenological data to make hypotheses about climate change in Wisconsin.
- Use a database to record phenological data.

*“If you want an adventure,
take the same walk that
you took yesterday, and
do so again tomorrow.”*

– John Burroughs



Background

Phenology is the branch of ecology that explores the seasonal timing of life cycle events. It often crosses multiple scientific disciplines by relating biological processes to weather conditions. Phenology includes the study of many events such as the migration of birds, the blooming of flowers and woody plants, animal reproduction, and the emergence of insects and other critters.

Just as there are regional differences in temperatures and other weather patterns, there are regional differences in biological events. Factors such as latitude, longitude, topography and the buffering of temperature changes by large bodies of water such as the Great Lakes contribute to these regional differences.

Because many biological events are triggered by or timed to climatic conditions, phenological observations of plants and animals can be an indicator of climate changes. They can also foretell the ecosystem impacts and disruptions caused by climate changes.

Phenology researchers record the timing of various biological events from year to year in a specific geographical location. If such observations are recorded over many years, using comparable techniques, the phenological data can paint a picture of the climatic conditions in that place over those years. Aldo Leopold, a notable Wisconsin ecologist and environmental writer, recorded years of phenology data. His observations supported his land ethic, harmony between



humans and ecosystems, a belief that made him one of the first stewards of conservation in the United States.

In order to effectively understand changes in the climate using phenology, day-to-day observations of animals, plants, weather, or other natural phenomenon are necessary over many years.

activity

ECOSYSTEM PHENOLOGY

Ecosystem Journal

Students make simple observations and create a journal so they can explore the links between the weather and the timing of events in the natural world.

Procedure

1) Begin the class by brainstorming what students think would be an easy way to observe and record climate change. Ask students, “Do you need expensive scientific equipment or an ecosystem biologist to help to record climate change?” Discuss with students how they can easily observe climate change from their own backyards by simply using their observational skills.

2) Have students discuss the concept of phenology. How is it defined and how is it recorded? Discuss some cyclical events that occur in the natural world. If any students have lived or visited elsewhere, you can discuss regional differences, e.g. between northern and southern Wisconsin, closer or further from one of the Great Lakes, in different parts of the country, etc.

3) Have students start and keep a journal to record phenologic events in their own neighborhood or outside their school. Let them choose which events they would like to record (examples include: date in autumn when leaves on a specific tree start to turn color, the first observation of a robin in

spring, flowering of a species of plant, ripening of strawberries in the garden, the first sound of spring peepers).

4) Discuss in detail how exactly the observations will be made so subsequent classes can record data in a similar way. Discuss the importance of agreeing on specific procedures for observing and recording events if data are to be compared from year to year.

5) Have the students use the *Ecosystem Phenology Worksheet* to record their phenological data events. Students may then use a spreadsheet program (e.g. *Excel*) to enter the data.

6) Discuss the concept of creating a long-term school journal that can be used from year to year—like a biological time capsule. With students, develop a phenological list to use for each season of plant and animal behaviors and events. Have the class set up a system for having their journals carried on in the future. How many years will it be before today’s kindergarteners would be entering their observations?

Discussion Questions

1) How do you think phenological data will help us further understand climate change in Wisconsin?

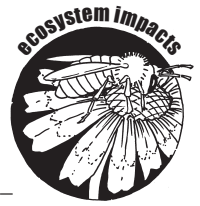
2) What might be some ecosystem and species-survival challenges if some parts of an ecosystem change the timing of their biological events, but others do not?
Hint, think about an insect that emerges on the same date every spring and pollinates a particular type of blooming plant. What happens if the plant blooms earlier, but the insect doesn’t change the date it emerges?

3) If students create a journal in which each subsequent class will record data, how many years of data do they think will be needed to judge whether there is a pattern of change? How would they know what may have contributed to any changes?

Going Beyond

- 1) Have students develop a Phenology Calendar focused on natural events in the schoolyard. Some annual events might include sounds of the first robin, first maple tree budding or showing color in the fall, first emergence of worms on the school grounds, etc.
- 2) Have students interview a family member, neighbor, or friend who could have observed natural events 40-60 years ago. Do they remember natural events happening later or earlier than they do now? Do they believe the climate is changing based on their own observations of the natural world?
- 3) There is a national phenology network about plants called *Project BudBurst*. The network asks citizens to contribute to their database. More classroom phenology activities for students of all ages can be found on their website.





NAME _____ CLASS _____

TEACHER _____ DATE _____

SPECIES	
DATE	WEATHER
BEHAVIOR/ACTIVITY OBSERVED	
OTHER OBSERVATIONS	

SPECIES	
DATE	WEATHER
BEHAVIOR/ACTIVITY OBSERVED	
OTHER OBSERVATIONS	

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