

Teachers Guide

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“Nature’s Calendar” Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article “Nature’s Calendar” by Dawn Flinn. Illustrations by Betsy Bowen. Published in the January–February 2007 *Minnesota Conservation Volunteer*, or visit www.dnr.state.mn.us/young_naturalists/phenology.

Young Naturalists teachers guides are provided free of charge to classroom teachers, parents, and students. This guide contains a brief summary of the articles, suggested independent reading levels, word counts, materials list, estimates of preparation and instructional time, academic standards applications, preview strategies and study questions overview, adaptations for special needs students, assessment options, extension activities, Web resources (including related Conservation Volunteer articles), copy-ready study questions with answer key, and a copy-ready vocabulary sheet and vocabulary study cards. There is also a practice quiz (with answer key) in Minnesota Comprehensive Assessments format. Materials may be reproduced and/or modified a to suit user needs. Users are encouraged to provide feedback through an online survey at www.dnr.state.mn.us/education/teachers/activities/ynstudyguides/survey.html.



Summary

“Nature’s Calendar” is an excellent introduction to the science of phenology, the study of plant and animal life cycles. While the text describes how phenologists work and explains why close observation of our natural world is useful and important, accompanying illustrations and lists, organized into three-month quarters, provide specific examples of phenomena readers might observe.

Suggested reading levels:

fifth grade through high school

Total words:

1,095

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Materials: 3-ring binders, loose-leaf notebook paper, poster board, pencils, pens, markers, and print resources from your media center.

Preparation time: One to two hours, not including preparation for extension activities

Estimated instructional time: Two to three 50-minute class periods (not including extensions)

Minnesota Academic Standards applications: “Nature’s Calendar” may be applied to the following Minnesota Department of Education Academic Standards:

Language Arts

I. Reading and Literature

- A. Word Recognition, Analysis and Fluency
- B. Vocabulary Expansion
- C. Comprehension

II. Writing

- A. Types of Writing
- B. Elements of Composition
- C. Spelling
- D. Research
- E. Handwriting and Word Processing

III. Speaking, Listening and Viewing

- A. Speaking and Listening
- B. Media Literacy

Minnesota History and Social Studies

II. Minnesota History: Grades 4–8

- A. Pre-Contact to 1650: Students will demonstrate knowledge of Minnesota’s indigenous peoples.

V. Geography: Grades 4–8

- D. Interconnections: The student will identify examples of the changing relationships between

patterns of settlement and land use in Minnesota.

Grades 4–12

- E. Essential Skills: The student will use maps, globes, geographic information systems and other sources of information to analyze the natures of places at a variety of scales.

Science

Grade 5

I. History and Nature of Science

- C. Scientific Enterprise

IV. Life Science

- E. Biological Populations Change Over Time
- F. Flow of Matter and Energy

Grade 7

I. History and Nature of Science

- A. Scientific World View

IV. Life Science

- B. Diversity of Organisms
- C. Interdependence of Life
- E. Biological Populations Change Over Time
- F. Flow of Matter and Energy

Grade 9–12

IV. Life Science

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B. Diversity of Organisms
C. Interdependence of Life
E. Biological Populations
Change Over Time

F. Flow of Matter and Energy

Arts

Artistic Expression: Visual Arts

Complete Minnesota Academic Standards are available at www.education.state.mn.us. Teachers who find other connections to standards are encouraged to contact *Minnesota Conservation Volunteer*.

Preview Survey the article. Ask your students to examine the illustrations. Use the **KWL** strategy (Ogle, 1986) to find out what your students already know (**K**) about natural cycles, what (**W**) they would like to learn, and eventually, what they learned (**L**) while reading the article and related materials and through participating in extension activities. Display your **K** and **W** ideas on poster board or paper (see Vocabulary preview, below). Add to your **L** list as you read and discuss the article, complete the study guide, and do extension activities. See www.teach-nology.com/web_tools/graphic_org/kwl for a **KWL** generator that will produce individual organizers for your students. You may also wish to introduce interdisciplinary connections during extension activities. For example, if you plan to use the article while studying Minnesota history, climate change, or geography, you may ask students to relate their prior knowledge (**K**), questions (**W**) and new information (**L**) to the subject you are teaching.

Vocabulary preview You may wish to preview the attached vocabulary list as well as other words based on your knowledge of your students’ needs. Connections to vocabulary in the articles may be made during the KWL activity. Ask students to find and highlight the vocabulary words on the list. These are key concepts and should be discussed before reading. If students are not familiar with some of the terms, include them in the W list. Other unfamiliar terms may be added to the W list as the articles are read. Eventually they can be moved to the L list. You may write vocabulary from the article in green ink, while other ideas are written in black.

You may wish to use the study cards found at the end of this guide (see Hock, Deshler, and Schumaker, 2000). Cut along the horizontal lines, fold in the middle, tape or staple, and use to learn vocabulary. Blanks are provided to allow you or your students to add new words or phrases. On one side of the card, in large letters, write a key word or phrase from the article that students are expected to know. In smaller letters frame the word or phrase in a question or statement. On the other side of the card, in large letters, write the answer to the question. Finally, in smaller letters, frame the answer in a question or statement whose answer is the key word or phrase on the reverse.

Study questions overview Study questions parallel the story (the answer to the first question appears first in the article, followed by the second, and so on). Preview the entire

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guide with your class before you read the article. You may wish to read the article aloud and complete the study questions in class, in small groups, or as an independent activity. The questions may be assigned as homework, depending on the reading ability of your students. Inclusion teachers may provide more direct support to special needs students (see Adaptations section). The study questions may be also used as a quiz. Note: Items 4, 5, 6, and 8 require analytical thinking.

Adaptations Read aloud or record for special needs students. Abbreviate the study questions or highlight priority items to be completed first (e.g., items 1, 2, 6, and 9. If time allows, remaining items may be attempted. Peer helpers, paraprofessionals, or adult volunteers may lend a hand with the study questions. With close teacher supervision, cooperative groups can also offer effective support to special needs students, especially for extension activities.

Assessment You may use all or part of the study questions, combined with vocabulary, as a quiz. Other assessment ideas: (1) Students may write an essay describing how phenology can help document the effects of global climate change. (2) Students may compare and contrast features of a specific habitat, such as a wetland, as they change from one season to the next. (3) Poster presentations may illustrate how climate change has affected habitat ranges (see turkey vultures and opossums in Extensions). (4) Students’ phenology notebooks (see extension activities below) may be evaluated.

- Extension activities**
1. Students may begin phenology notebooks in the fall in order to record plant and animal seasonal patterns during winter and spring. See Web resources for several resources that facilitate accurate record keeping.
 2. Bird feeders offer students an often-overlooked opportunity to observe and record bird behavior patterns over fall, winter, and spring.
 3. For the Scientific Enterprise and Scientific World View sub-strands in grades five and seven, students may discover the work of prominent phenologists such as Rachel Carson, Aldo Leopold, or Sigurd Olson.
 4. Climate change has encouraged some animal species, such as the turkey vulture and opossum, to extend their ranges northward into central and even northern Minnesota. Students may investigate range extensions of other species of animals and also plants.
 5. Your students may join a phenology data exchange through a variety of sources, including Journey North, KAXE—a community radio station in Grand Rapids, Minn.—and the National Phenology Network.
 6. Minnesota History standards include the study of the indigenous peoples who lived here prior to European colonization. Wild ricing and maple sugaring are two examples of seasonal activities that may provide opportunities for field trips or guest speakers. Samples of Minnesota wild rice and maple sugar are widely available. A spin-off activity would be to examine the controversy surrounding the cultivation of wild rice.

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Web resources

Data-sharing sites:

www.learner.org/jnorth
www.dnr.wi.gov/eek/nature/season/pheno.asp
www.phenology.org
www.uwm.edu/Dept/Geography/npn/
www.learner.org/jnorth/tm/PhenDataExchange.html

General phenology information:

www.sws-wis.com/lifecycles/what.html

Climate change

www.npr.org/templates/topics/topic.php?topicId=1025
www.pewclimate.org
www.epa.gov/climatechange

Birds:

www.dnr.state.mn.us/birdfeeding/index.html
www.learner.org/jnorth/tm/robin/RobinPhenology.html
www.eraptors.org/turkey-vulture-range.htm

Opossums

www.dnr.state.mn.us/snapshots/mammals/
virginiaopossum.html

Longitude-Latitude

www-istp.gsfc.nasa.gov/stargaze/Slatlong.htm and
www.bcca.org/misc/qiblih/latlong_us.html

Connections to phenology can be found in many *Minnesota Conservation Volunteer* articles. *Minnesota Conservation Volunteer* articles are available online at www.dnr.state.mn.us/volunteer/past_issues.html. Young Naturalists articles and teachers guides are found at www.dnr.state.mn.us/young_naturalists.

Print resources

Animal Species and Habitat Publications:

www.dnr.state.mn.us/ecological_services/pubs_animals_habitat.html

References

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2. Levine, M. *The Ojibwe*. Minneapolis: Lerner Publishing, 2007.
3. Ogle, D.S. K-W-L Group Instructional Strategy. In A.S. Palincsar, D.S. Ogle, B.F. Jones, and E.G. Carr (Eds.), *Teaching Reading as Thinking: Teleconference Resource Guide*, pp.11–17. Alexandria, Va.: Association for Supervision and Curriculum Development, 1986.
4. Regguinti, G. *The Sacred Harvest: Ojibway Wild Rice Harvesting*. Minneapolis: Lerner Publishing, 1992.
5. Weber, Larry, and Gibbs, Judy. *Backyard Almanac*. Minneapolis: University of Minnesota Press, 1995.
6. Wittstock, L.W. *Ininatag’s Gift of Suga: Traditional Native Sugarmaking*. Minneapolis: Lerner Publishing, 1993.

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Study Questions

“Nature’s Calendar,” by Dawn Flinn. Illustrations by Betsy Bowen

Minnesota Conservation Volunteer, January–February 2007

www.dnr.state.mn.us/young_naturalists/phenology

Name _____ Period _____ Date _____

1. It’s January, and you are looking forward to spring. What clues might tell you whether spring will be early this year? _____

2. How did observing natural events help American Indians survive? _____

3. When and where were the first phenology records made? _____

4. Why may phenological records be important in understanding global climate change? _____

5. How long do you think you would have to keep a nature notebook/calendar before it would help you predict seasonal events? _____

6. List some events you might record in your notebook or on your calendar. _____ .

7. Explain the difference between longitude and latitude. _____ .

8. Why is knowing about longitude and latitude important to phenologists? _____

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9. Match the natural event with the season in which you are most likely to observe it. _____
- | | |
|---|----------------------------|
| Maple tree sap begins to flow _____ | Winter (December–February) |
| Toads burrow into the ground _____ | Spring (March–May) |
| Chipmunks are back at the bird feeder _____ | Summer (June–August) |
| A raccoon suns itself on a snowy brancy _____ | Fall (September–November) |
| You find a white-tailed buck’s recently shed antler _____ | |
| You are bitten by a black fly _____ | |
| You shoo a deerfly away _____ | |
| You see fireflies _____ | |

Challenge: Use latitude and longitude to estimate how much earlier in spring robins will appear in Minneapolis than in Bemidji. _____

Study Questions Answer Key

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1. It’s January, and you are looking forward to spring. What clues might tell you that spring will be early this year? **Answers will vary, but should include events normally observed in February, March, or April.**
2. How did observing natural events help American Indians survive? **Answers will vary, but should include that natural events helped Native Americans know when to fish, tap maple trees for sap, and plant crops.**
3. When and where were the first phenology records made? **About 2,000 years ago in China**
4. Why may phenological records be important in understanding global climate change? **Answers will vary, but the critical idea is that changes in timing of plant and animal events may be associated with changes in climate. Study of phenological records over long periods of time help us uncover trends.**
5. How long do you think you would have to keep a nature notebook/calendar before it would help you predict the seasons? **Answers will vary regarding, but several years would be necessary to begin to see patterns.**
6. List some events you might record in your notebook or on your calendar. **Migrating birds returning, leaves turning color, baby animals emerging, and frogs calling are just some of many examples your students may list. Phenology notebooks may also include events such as the first snowfall, or ice-over/ice-out.**
7. Explain the difference between longitude and latitude. **Latitude lines run east–west on a map or globe, and measure the distance of a location north or south of the equator. Longitude lines run north–south and measure the distance of a location east or west of the prime meridian.**
8. Why is knowing about longitude and latitude important to phenologists? **Because location influences the timing of seasonal changes. For example, the farther south you live in Minnesota, the earlier you will observe the return of migrating birds or the first tulips poking through the soil in spring.**
9. Match the natural event with the season in which you are most likely to observe it.
Maple tree sap begins to flow **Spring**
Toads burrow into the ground **Fall**
Chipmunks are back at the bird feeder **Spring**
A raccoon suns itself on a snowy branch **Winter**
You find a white-tailed buck’s recently shed antler **Winter**
You are bitten by a black fly **Spring**
You shoo a deerfly away **Summer**
You see fireflies **Summer**

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Challenge: Use latitude and longitude to estimate how much earlier spring robins will appear in Minneapolis than in Bemidji. **Bemidji has a latitude of 47 degrees, 31 minutes north, and a longitude of 94 degrees, 56 minutes west. Minneapolis lies at a latitude of 44 degrees, 53 minutes north and a longitude of 93 degrees, 13 minutes west. So, Bemidji is a little more than 2½ degrees north and 1½ degrees west of Minneapolis. You would, therefore, expect to see a robin 12 to 14 days earlier in Minneapolis. Your students can use the Internet to find the latitude and longitude of Bemidji and Minneapolis.**

Minnesota Comprehensive Assessments Practice Items

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Name _____ Period _____ Date _____

1. Orioles spend the winter months in _____.
 - A. Australia
 - B. Ohio
 - C. Duluth
 - D. Central America

2. A _____ are useful tools for a phenologist.
 - A. rake and shovel
 - B. hand lens and binoculars
 - C. hammer and saw
 - D. needle and thimble

3. _____ lines measure distance north or south of the equator.
 - A. Latitude
 - B. Longitude
 - C. Diagonal
 - D. Vertical

4. Some birds _____ from Minnesota to a warmer climate for the winter.
 - A. hibernate
 - B. migrate
 - C. translate
 - D. designate

5. Phenology is an important part of the study of _____.
 - A. plate tectonics
 - B. global warming
 - C. war and peace
 - D. poverty

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1. Orioles spend the winter months in **D. Central America**.
2. A **B. hand lens and binoculars** are useful tools for a phenologist.
3. **A. Latitude** lines measure north or south distance from the equator.
4. Some birds **B. migrate** from Minnesota to a warmer climate for the winter.
5. Phenology is an important part of the study of **B. global warming**.

Vocabulary

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catkins	furry cluster of tiny flowers
cicadas	large grasshopperlike insects that make a loud sound
courtship	behavior that attracts a mate
cumulous	piled-up, fluffy clouds
fritillaries	colorful butterflies
global warming	a gradual increase in the average temperature of Earth’s atmosphere
hibernate	to be in a sleeplike state for winter
latitude	distance north or south of the equator
longitude	distance east or west of the prime meridian
migrate	move from one habitat to another with the change in seasons
migratory	animals that move between habitats with the change in seasons
nectar	a sweet liquid that helps flowers attract pollinating birds and insects
pectinations	hairlike projections on a ruffed grouse’s feet.

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Vocabulary Study Cards

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Cut along the horizontal lines, fold in the middle and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

To
hibernate
means

To
sleep during the winter
means to

What does
cumulous
mean?

**Clouds that are piled up and
fluffy**
are

What is
global warming?

**Increasing temperature of
Earth’s atmosphere**
are

What are
catkins

Furry clusters of tiny flowers
are called

to
migrate
is to

To
**move from one habitat to
another**
is to

A
migratory
animal

**An animal that
moves from one habitat to
another**
is

What are
courtship
behaviors?

Behaviors that attract a mate
are called

What is
latitude?

**A measure of north-south
distance
is**

What is
longitude?

**A measure of east-west
distance
is**

Fritillaries
are

Certain colorful butterflies
are called

What is flower
nectar?

**A sweet liquid that flowers
use to attract birds and insects
for pollination
is called**

What are
cicadas?

**Large grasshopperlike insects
that make a shrill sound**
are called

What are
pectinations?

**Hairlike projections on the
feet of ruffed grouse**
are called

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