

# TEACHERS GUIDE

## TO “NATURE ON THE MOVE”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, January–February 2015, [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine)

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*Minnesota Conservation Volunteer* magazine tells stories that connect readers to wild things and wild places. Subjects include earth science, wildlife biology, botany, forestry, ecology, natural and cultural history, state parks, and outdoor life.

**Education has been a priority** for this magazine since its beginning in 1940. “One word—Education—sums up our objective,” wrote the editors in the first issue. Thanks to the MCV Charbonneau Education Fund, every public library and school in Minnesota receives a subscription. Please tell other educators about this resource.

**Every issue now features** a Young Naturalists story and an online Teachers Guide. As an educator, you may download Young Naturalist stories and reproduce or modify the Teachers Guide. The student portion of the guide includes vocabulary cards, study questions, and other materials.

**Readers’ contributions** keep *Minnesota Conservation Volunteer* alive. It is the only state conservation magazine to claim the distinction of being financially supported by contributions from its readers.

**Find every issue online.** Each story and issue is available in a searchable PDF format. Visit [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine) and click on *Past issues*.

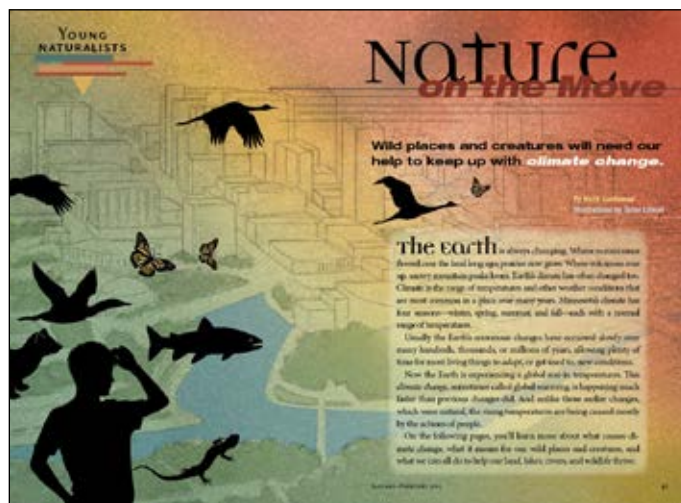
**Take a few minutes** to tell us what you think about this education resource by filling out this short survey.

**Thank you** for bringing Young Naturalists into your classroom!

## “NATURE ON THE MOVE”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, January–February 2015, [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine)

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**SUMMARY.** “Nature on the Move” gives young readers a brief introduction to climate science. Students learn how current climate change is different from past climate changes, how it is likely to affect Minnesota’s plants and animals, and what can be done to slow the build up of greenhouse gases in our atmosphere. *Note: This article connects well with many eighth grade earth and space science standards.*

**SUGGESTED READING LEVELS.** Third through middle school grades

**MATERIALS.** KWL organizer, paper, poster board, colored pencils, crayons, pens, markers, NASA online climate trivia game (<http://climatekids.nasa.gov/trivia/>), print and online resources your media specialist may provide

**PREPARATION TIME.** One to two hours, not including time for extension activities

**ESTIMATED INSTRUCTION TIME.** One or two 50-minute class periods (not including extensions)

**MINNESOTA ACADEMIC STANDARDS APPLICATIONS.** “Nature on the Move” may be applied to the following Minnesota Department of Education standards:

**LANGUAGE ARTS READING BENCHMARKS INFORMATIONAL TEXT 3–8.** Key Ideas and Details, Craft and Structure, Integration of Knowledge and Ideas, Range of Reading, and Level of Text Complexity

**WRITING BENCHMARKS 3–8.** Text Types and Purposes, Writing Process, Research to Build and Present Knowledge, Range of Writing

**READING BENCHMARKS: LITERACY IN IN SCIENCE AND TECHNICAL SUBJECTS 6–12.** Key Ideas and Details, Craft and Structure, Integration of Knowledge and Ideas, Range of Reading, and Level of Text Complexity

**WRITING BENCHMARKS: LITERACY IN HISTORY/SOCIAL STUDIES, SCIENCE AND TECHNICAL SUBJECTS 6–12.** Text Types and Purposes, Writing Process: Production and Distribution of Writing Research to Build and Present Knowledge, Range of Writing

### **SCIENCE GRADES 3, 5, 6, 7, 8 AND HIGH SCHOOL**

The Nature of Science and Engineering

5.1.1.1.1; 5.1.1.1.2; 5.1.1.1.3; 5.1.1.1.4; 5.1.3.4.1; 5.1.3.4.2; 7.1.1.2.1; 7.1.1.2.4; 7.1.3.4.1; 8.1.1.1.1; 8.1.1.2.1; 8.1.3.4.1

Interactions Among Science, Technology, Engineering, Mathematics, and Society

3.1.2.2.1; 3.1.3.2.2; 3.1.3.4.1

Earth and Space Science

4.3.2.3.1; 5.3.1.2.1; 5.3.1.2.2; 5.3.4.1.1; 5.3.4.1.2; 5.3.4.1.3; 8.3.1.3.1; 8.3.2.1.1; 8.3.2.1.2; 8.3.2.1.3; 8.3.2.2.1; 8.3.2.2.2; 8.3.2.2.3; 8.3.4.1.1

Life Science

5.4.1.1.1; 5.4.2.1.2; 5.4.4.1.1; 7.4.2.1.3; 7.4.2.2.1; 7.4.3.2.1; 7.4.3.2.3; 7.4.3.2.4; 7.4.4.1.2

### **SOCIAL STUDIES GRADES 3, 5, 6, 7, 8 AND HIGH SCHOOL**

Geography

4.3.1.2.1; 4.3.2.3.1; 4.3.3.6.1; 4.3.4.9.1; 5.3.4.10.1; 8.3.1.1.1; 8.3.1.2.1; 8.3.3.6.1

### **ARTS GRADES K–12.**

1. Artistic Foundations: Visual Arts
2. Artistic Process: Create or Make: Visual Arts
3. Artistic Process: Perform or Present: Visual Arts
4. Artistic Process: Respond or Critique: Visual Arts

Current, complete Minnesota Academic Standards are available at [www.education.state.mn.us](http://www.education.state.mn.us). Teachers who find other connections to standards are encouraged to contact *Minnesota Conservation Volunteer*.

**PREVIEW.** (1) See the NASA climate trivia game at <http://climatekids.nasa.gov/trivia/>, an eight-question quiz that you can do with your class or that your students can do individually if they have laptops or tablets. The quiz should prompt questions that heighten interest in the article. (2) Instead of (or in addition to) the climate quiz, you may do a **KWL** (Ogle, 1986) activity. To find out what your students already know (K), divide the class into small groups and have each group brainstorm ideas about climate and climate change. Give each student a copy of the organizer (see [www.teach-nology.com/web\\_tools/graphic\\_org/kwl](http://www.teach-nology.com/web_tools/graphic_org/kwl)) and encourage each to make notes during the small group discussion. Post their ideas on a flip chart or poster board. Repeat step one by asking students what they would like to learn about climate and climate change (W). As with (K), post for future reference. As you read and discuss the article you will begin to compile the (L) list, or what they learn while reading the article and related materials and participating in extension activities. KWL gives you the opportunity to introduce interdisciplinary connections you will make during extension activities. If you use the article in science, social studies, or art class, you may wish to focus your pre-reading activity on academic standards that apply for that class. (3) See [www.teachervision.fen.com/tv/printables/TCR/0743932080\\_007.pdf](http://www.teachervision.fen.com/tv/printables/TCR/0743932080_007.pdf) for a brainstorming web download.

**VOCABULARY PREVIEW.** See the copy-ready vocabulary list included in this guide. You may wish to modify the list based on your knowledge of your students' needs or the subject you are teaching. Pretesting vocabulary individually, in small groups, or with your entire class can be an effective vocabulary preview strategy. You may then post-test at the conclusion of this activity (see Assessment section below). Italicized words are not generally included on the list or in the study cards.

You may wish to use the study cards found at the end of this guide. Cut along the horizontal line; fold in the middle, and tape or staple. Study cards (see *Strategic Tutoring*, Hock, Deshler, and Schumaker 2000) can be applied to any subject area. On one side of the card, in large letters, write a key word or phrase 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. Blanks are provided to allow you or your students to add new words or phrases.

**STUDY QUESTIONS.** 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 guide with your class before you read the article.** You may wish to read the story 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 with an asterisk require varying degrees of critical thinking.

**ADAPTATIONS.** Read aloud to special needs students. Abbreviate the study questions or highlight priority items to be completed first. 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 guide, combined with vocabulary, as a quiz. Other assessment ideas include: (1) Students may sketch and describe the carbon cycle. (2) Students may write multiple-choice, true-false, or short-answer questions. Select the best items for a class quiz. (3) Students may write essays describing the environmental challenges that climate change poses for Minnesota and/or the world. Students may write about how climate change might change a favorite outdoor activity, such as a family camping trip, fishing with grandparents, or cross-county skiing. (4) Use a Venn diagram to compare and contrast the concepts of weather and climate. (5) Poster presentations may supplement or take the place of essays. Students may work in small groups with each group focusing on a different big idea from the article.

**EXTENSION ACTIVITIES.** Extensions are intended for individual students, small groups, or your entire class. Young Naturalists articles provide teachers many opportunities to make connections to related topics, to allow students to follow particular interests, or to focus on specific academic standards.

1. “The Crossroads of Climate Change,” while not a Young Naturalists article, is an accessible companion piece for “Nature on the Move.” See Related Articles for link.
2. Encourage students to learn more about the climate-sensitive plant and animal species highlighted in the article. What would Minnesota be without its state bird (loon) and state tree (red pine)?
3. See the short video, “Trend and Variation,” (<https://www.youtube.com/watch?v=e0vj-0imOLw>) to help answer the question, “If the earth’s atmosphere is warming, why are we having such a cold winter?”
4. Challenge students to find out more about climate science and meteorology. Links below will get you started. The fourth assessment activity (compare and contrast weather and climate) may also be used as an extension.
5. Play a carbon cycle game. Several versions are available on line. See Web resources.
6. See “Why I Must Speak Out About Climate Change,” “The Science Behind Climate Headlines,” “Emergent Patterns of Climate Change,” and “The State of the Climate—and What We Might Do About It” TED Talks (links below). These are challenging pieces, but many of your students will find them accessible.
7. Calculate your students’ carbon footprints with one of the websites listed in Web resources. What is the cumulative footprint of your classroom? Make a list of ways you and your students can reduce your carbon footprint.

## WEB RESOURCES

### DNR

[www.dnr.state.mn.us/climate/index.html](http://www.dnr.state.mn.us/climate/index.html)  
[www.dnr.state.mn.us/waters/index.html](http://www.dnr.state.mn.us/waters/index.html)  
[www.dnr.state.mn.us/animals/index.html](http://www.dnr.state.mn.us/animals/index.html)  
[www.dnr.state.mn.us/forests/index.html](http://www.dnr.state.mn.us/forests/index.html)  
[www.dnr.state.mn.us/plants/index.html](http://www.dnr.state.mn.us/plants/index.html)  
[www.dnr.state.mn.us/prairierestoration/index.html](http://www.dnr.state.mn.us/prairierestoration/index.html)

### CARBON CYCLE GAMES

[http://oceanservice.noaa.gov/education/pd/climate/teachingclimate/carbon\\_cycle\\_game.pdf](http://oceanservice.noaa.gov/education/pd/climate/teachingclimate/carbon_cycle_game.pdf)  
[https://www.windows2universe.org/earth/climate/carbon\\_cycle.html](https://www.windows2universe.org/earth/climate/carbon_cycle.html)

### CARBON FOOTPRINT

[www.epa.gov/climatestudents/calc/index.html](http://www.epa.gov/climatestudents/calc/index.html)  
<http://footprint.wwf.org.uk/>

### CLIMATE CHANGE FOR KIDS

[www.epa.gov/climatestudents/](http://www.epa.gov/climatestudents/)  
<http://climatekids.nasa.gov>  
<http://tiki.oneworld.org>

### CLIMATE IN MINNESOTA

<http://climate.umn.edu>  
[www.dot.state.mn.us/climate/flashfloodlinks.html](http://www.dot.state.mn.us/climate/flashfloodlinks.html)

### COMPARE AND CONTRAST

[www.readwritethink.org/files/resources/interactives/compcontrast/](http://www.readwritethink.org/files/resources/interactives/compcontrast/)  
[www.readingquest.org/strat/compare.html](http://www.readingquest.org/strat/compare.html)

### WEATHER

[www.stcloudstate.edu/weather/drought.asp](http://www.stcloudstate.edu/weather/drought.asp)  
[www.education.noaa.gov](http://www.education.noaa.gov)  
[www.conservationminnesota.org/interests/weather-climate/](http://www.conservationminnesota.org/interests/weather-climate/)

### TED TALKS ON CLIMATE

[https://www.ted.com/talks/james\\_hansen\\_why\\_i\\_must\\_speak\\_out\\_about\\_climate\\_change](https://www.ted.com/talks/james_hansen_why_i_must_speak_out_about_climate_change)  
[https://www.ted.com/talks/gavin\\_schmidt\\_the\\_emergent\\_patterns\\_of\\_climate\\_change](https://www.ted.com/talks/gavin_schmidt_the_emergent_patterns_of_climate_change)  
[https://www.ted.com/talks/rachel\\_pike\\_the\\_science\\_behind\\_a\\_climate\\_headline](https://www.ted.com/talks/rachel_pike_the_science_behind_a_climate_headline)  
[www.ted.com/talks/lord\\_nicholas\\_stern\\_the\\_state\\_of\\_the\\_climate\\_and\\_what\\_we\\_might\\_do\\_about\\_it](http://www.ted.com/talks/lord_nicholas_stern_the_state_of_the_climate_and_what_we_might_do_about_it)

## MINNESOTA DNR TEACHER RESOURCES

[www.mndnr.gov/education/teachers/index.html](http://www.mndnr.gov/education/teachers/index.html)

[www.mndnr.gov/dnrkids/index.html](http://www.mndnr.gov/dnrkids/index.html)

\*Note: All websites were active at the time of this guide's publication. However, some may no longer be active when this guide is accessed.

**RELATED ARTICLES.** In addition to the related articles listed below, every *Minnesota Conservation Volunteer* article published since 1940 is now online in searchable PDF. See [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine). Young Naturalists articles and teachers guides are found at [www.dnr.state.mn.us/mcvmagazine/young-naturalists.html](http://www.dnr.state.mn.us/mcvmagazine/young-naturalists.html).

### January–February 2001

“The Crossroads of Climate Change”

[https://webapps8.dnr.state.mn.us/volunteer\\_index/past\\_issues/article\\_pdf?id=1387](https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=1387)

### May–June 2003

“The Slinky, Stinky Weasel Family” (YN article with teachers guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/weasels/weasels.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/weasels/weasels.pdf)

### July–August 2003

“Hey, How’s the Weather?” (YN article with teachers guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/weather/weather.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/weather/weather.pdf)

### January–February 2007

“Nature’s Calendar” (YN article with teachers guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/phenology/phenology.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/phenology/phenology.pdf)

### July–August 2007

“Hoot, Tremolo, Yodel, and Wail” (YN article with teacher guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/loons/loons.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/loons/loons.pdf)

### January–February 2009

“Ubiquitous Conifers” (YN article with teachers guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/conifers/conifers.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/conifers/conifers.pdf)

## July–August 2012

“Little Habitats on the Prairie” (YN article with teacher guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/prairie/prairie.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/prairie/prairie.pdf)

## September–October 2014

“Niches for Everyone” (YN article with teachers guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/niches/sepoct2014\\_young\\_naturalists.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/niches/sepoct2014_young_naturalists.pdf)

## REFERENCES

Hock, M.F., Deshler, D.D., and Schumaker, J.B. *Strategic Tutoring*. Lawrence, Kan.: Edge Enterprises, 2000.

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.

**STUDY QUESTIONS ANSWER KEY.** “Nature on the Move” by Keith Goetzman with illustrations by Taina Litwak. Published in the January–February 2015 *Minnesota Conservation Volunteer*, or visit [www.mndnr.gov/young\\_naturalists](http://www.mndnr.gov/young_naturalists).

1. Minnesota’s prairies used to be **an ocean**.

\*2. The climate of the Earth has not changed in millions of years. True **False**

3. The climate of Minnesota has four **seasons**.

4. Contrast current climate change to past changes in climate. **The climate change we are experiencing now is happening much faster than past climate changes.**

5. How does the atmosphere of the earth benefit humans? **Our atmosphere provides the air we breathe and water to drink. It also provides a blanket to keep Earth warm enough to support diverse plant and animal life.**

6. What are greenhouse gases, and how do they affect our atmosphere? **Greenhouse gases, such as carbon dioxide and methane, trap the sun’s heat. As more greenhouse gases are released into the atmosphere, more heat is trapped.**

7. What is the biggest reason our atmosphere is becoming warmer? **Increased use of fossil fuels, such as oil and coal, the biggest producers of greenhouse gases, is the primary cause of global warming.**

\*8. Use the diagram on page 42 to help describe the carbon cycle. **Answers will vary, but the big ideas are that there are two carbon cycles, natural and human-produced. In the natural carbon cycle, carbon dioxide is released during plant and animal respiration. Humans are releasing carbon that has been stored in fossil fuels for millions of years and is not a part of the natural cycle.**

\*9. What might you conclude from the graph on page 43? **Answers will vary. There has**



been a lot of variability in the concentration of carbon dioxide in the atmosphere over the past half million years, but it has never been more than about 300 parts per million (ppm). Today, due to fossil fuel consumption, the concentration is at 400 ppm.

10. Are climate and weather the same thing? Why or why not? **No, climate is the pattern of daily weather conditions over long periods of time. Weather is the temperature, sky conditions, wind, and humidity we experience each day.**

11. By the turn of the 21st century the Earth's temperature is expected to be **from 2 to 11.5 degrees warmer.**

\*12. How may climate change affect Minnesota's native plants and animals? **Answers will vary. For each of the species described on pages 44–47, a warming climate may mean that it will disappear from Minnesota, move farther north, or become susceptible to predators or diseases that move into Minnesota. Encourage students to give specific examples of how climate change will affect one or more of the species mentioned.**

13. What is our carbon footprint? **Carbon footprint refers to the amount of carbon each of us consumes.**

14. Give two examples of renewable resources. **Renewable resources include wind, solar, hydroelectric, and geothermal energy. Only wind and solar are mentioned in the article.**

15. Besides using renewable sources of energy, what are two other ways we can slow climate change? **We can conserve or save energy by using what we have more efficiently and we can invent new, energy-saving technologies such as LED light bulbs.**

16. What can you and your family do right now to reduce your carbon footprint? **Ideas include: smarter travel, eating locally grown food, turning down the thermostat, planting trees, and working with others to reduce your community's carbon footprint.**

\*Challenge: If fossil fuels are the major source of greenhouse gases and scientists are confident that if we reduce fossil fuel consumption we can slow down and eventually reverse global warming, then why aren't we doing it? **Answers will vary. Challenge students to put themselves in the shoes of coal mine and oil well owners, gas station owners, car manufacturers and other groups who have vested interests in the carbon economy. Also consider what changing to renewable energy may cost consumers.**

**MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY.** "Nature on the Move" by Keith Goetzman with illustrations by Taina Litwak. Published in the January–February 2015 *Minnesota Conservation Volunteer*, or visit [www.mndnr.gov/young\\_naturalists](http://www.mndnr.gov/young_naturalists).

1. LED stands for **B. light-emitting diode.**
2. The American marten eats **D. A, B, and C.**
3. Lake trout are found in **A. 99 lakes in Minnesota**
4. Describe how climate change may affect our state bird. **A warmer climate will mean warmer water in lakes where loons breed. Insect parasites could harm loons and carp could make fishing more difficult.**
5. Methane is a greenhouse gas. **True** False

**VOCABULARY ANSWER KEY.** “Nature on the Move” by Keith Goetzman with illustrations by Taina Litwak. Published in the January–February 2015 *Minnesota Conservation Volunteer*, or visit [www.mndnr.gov/young\\_naturalists](http://www.mndnr.gov/young_naturalists).

**carbon** a chemical element that is present in all known life forms and takes many different forms, such as diamonds or graphite. Carbon has the chemical symbol C.

**carbon dioxide (CO<sub>2</sub>)** a naturally occurring chemical compound composed of two oxygen atoms and one carbon atom. CO<sub>2</sub> is the main source of carbon in life on Earth.

**climate** weather conditions most common in an area over a long period of time

**element** a pure chemical substance consisting of one type of atom

**Industrial Revolution** period in history from the mid 18th to mid 19th century when people moved from the country to the city to work in factories

**methane (CH<sub>4</sub>)** chemical compound with one carbon atom and four hydrogen atoms, and a major greenhouse gas

**metric ton** 1,000 kilograms or 2,205 pounds.

**parasite** organism that lives on or in its host organism and gets all its food from its host