

# TEACHERS GUIDE

## TO “COLOR BY NATURE”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, March–April 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*.

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

# “COLOR BY NATURE”

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**SUMMARY.** “Color by Nature” helps young readers understand that colors matter in nature. Following a brief explanation of the physical science of colors, examples of color adaptations in a variety of animals and plants demonstrate that color can be a matter of life and death. *Note: Please pass this on to your art teacher!*

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

**MATERIALS.** KWL organizer, paper, poster board, colored pencils, crayons, pens, markers, Coloration Quiz ([www.nhptv.org/natureworks/quiz2.htm](http://www.nhptv.org/natureworks/quiz2.htm)), 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.** “Color by Nature” may be applied to the following Minnesota Department of Education standards:

**LANGUAGE ARTS READING BENCHMARKS INFORMATIONAL TEXT GRADES 3–5; 6–12** Key Ideas and Details, Craft and Structure, Integration of Knowledge and Ideas, Range of Reading and Level of Text Complexity

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

**READING BENCHMARKS: LITERACY IN IN SCIENCE AND TECHNICAL SUBJECTS** 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** 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, 9–12 AND HIGH SCHOOL**

Physical Science

3.2.3.1.3; 6.2.3.1.3

Life Science

3.4.1.1.1; 5.4.1.1.1; 9.4.3.3.5

### **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 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) Serve fresh blueberries to your students. As they are enjoying the treat ask if anyone knows why blueberries are blue (or purple). Phrased another way, ask if their color gives blueberries an advantage. (2) Project the Coloration Quiz on your screen or SMART board. After your students respond, show the correct answers. Tell them they will learn a lot more about color adaptations in some Minnesota plants and animals. (3) Instead of (or in addition to) blueberry tasting and the coloration quiz, you may do a **KWL** (Ogle, 1986) activity. To find out what your students already know about colors in nature (K), divide the class into small groups and have each group brainstorm ideas. 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 color in nature (W). As with the (K) step, 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 options include: (1) You or your students may select one of the species in the article for a short essay that describes its color adaptation and how it enables the species to survive. (2) Students may write multiple-choice, true-false, or short-answer questions. Select the best items for a class quiz. (3) Poster presentations may supplement or take the place of essays. Students may work in small groups with each group focusing on a different species or 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. “Color On, Color Off” and “Why Is a Bluebird Blue?,” both Young Naturalists articles with teachers guides, are excellent companion pieces for “Color by Nature.” See Related Articles for links.
2. Encourage students to learn more about species of plants and animals featured in this story. Individuals or small groups may create colorful posters that describe the adaptations that allow the species to thrive.
3. See the TED Talk video, “Skin Color is an Illusion,” by anthropologist Nina Jablonski ([www.ted.com/talks/nina\\_jablonski\\_breaks\\_the\\_illusion\\_of\\_skin\\_color](http://www.ted.com/talks/nina_jablonski_breaks_the_illusion_of_skin_color)). Students may be surprised to learn that human skin color is an evolutionary adaptation to ultraviolet light. Most appropriate for upper middle and high school students.
4. Ask your students to create a Nature’s Color Wheel with photos and/or drawings of plants and animals that fit into primary, secondary, and tertiary color categories. You may create a large wheel that the entire class contributes to or smaller wheels for individuals or small groups.
5. For a more general look at adaptation that is designed for younger students see the YouTube video “Animal Adaptations for Kids—Lesson with Quiz” at [https://www.youtube.com/watch?v=yY4NNxka\\_to](https://www.youtube.com/watch?v=yY4NNxka_to)

## WEB RESOURCES

### DNR

[http://files.dnr.state.mn.us/natural\\_resources/animals/reptiles\\_amphibians/lizards/five-linedskink\\_fs.pdf](http://files.dnr.state.mn.us/natural_resources/animals/reptiles_amphibians/lizards/five-linedskink_fs.pdf)

[www.dnr.state.mn.us/reptiles\\_amphibians/frogs\\_toads/truefrogs/green.html](http://www.dnr.state.mn.us/reptiles_amphibians/frogs_toads/truefrogs/green.html)

[www.dnr.state.mn.us/reptiles\\_amphibians/snakes\\_turtles/redbellysnake.html](http://www.dnr.state.mn.us/reptiles_amphibians/snakes_turtles/redbellysnake.html)

[www.dnr.state.mn.us/birds/doublecrestedcormorant.html](http://www.dnr.state.mn.us/birds/doublecrestedcormorant.html)

[www.dnr.state.mn.us/insects/lost-ladybugs.html](http://www.dnr.state.mn.us/insects/lost-ladybugs.html)

[www.dnr.state.mn.us/mammals/weasel.html](http://www.dnr.state.mn.us/mammals/weasel.html)

[www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMAJF02020](http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMAJF02020)

[www.dnr.state.mn.us/mammals/whitetaileddeer.html](http://www.dnr.state.mn.us/mammals/whitetaileddeer.html)

[www.dnr.state.mn.us/insects/monarchbutterfly.html](http://www.dnr.state.mn.us/insects/monarchbutterfly.html)

### COLORATION

[www.nhptv.org/natureworks/nwep2.htm](http://www.nhptv.org/natureworks/nwep2.htm) (includes teachers guide)

### CAMOUFLAGE

<http://animals.howstuffworks.com/animal-facts/animal-camouflage2.htm>

## ADAPTATIONS

[https://www.teachervision.com/tv/printables/0132301865\\_129.pdf](https://www.teachervision.com/tv/printables/0132301865_129.pdf)  
[www.exploringnature.org/db/detail\\_index.php?dbID=5&dbType=2t](http://www.exploringnature.org/db/detail_index.php?dbID=5&dbType=2t)  
[www.animalplanet.com/wild-animals/animal-adaptations/](http://www.animalplanet.com/wild-animals/animal-adaptations/)  
[http://education.nationalgeographic.com/education/encyclopedia/adaptation/?ar\\_a=1](http://education.nationalgeographic.com/education/encyclopedia/adaptation/?ar_a=1)  
[www.scholastic.com/browse/lessonplan.jsp?id=1566](http://www.scholastic.com/browse/lessonplan.jsp?id=1566)

## SEASONAL ADAPTATIONS

<http://mff.dsisd.net/Environment/WinterAnimals.htm>  
[www.nwf.org/wildlife/wildlife-library/mammals/snowshoe-hare.aspx](http://www.nwf.org/wildlife/wildlife-library/mammals/snowshoe-hare.aspx)

## HUMAN ADAPTATION

<http://news.stanford.edu/news/2009/january21/evoladap-012109.html>

## COLOR WHEELS

<https://cios233.community.uaf.edu/design-theory-lectures/color-theory/>  
[www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm](http://www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm)  
[www.kidzone.ws/science/colorwheel.htm](http://www.kidzone.ws/science/colorwheel.htm)  
[www.mrprintables.com/printable-color-wheel.html](http://www.mrprintables.com/printable-color-wheel.html)

## 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).

### November–December 2001

“Color On, Color Off” (YN article with teachers guide)  
[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/albino\\_animals/albino\\_animals.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/albino_animals/albino_animals.pdf)

### 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)

### 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)

### September–October 2009

“Have Fun Painting Ducks” (YN article with teachers guide)

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

### July–August 2010

“Why Is a Bluebird Blue?” (YN article with teacher guide)

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

### January–February 2011

“The Greatest of Feet” (YN article with teachers guide)

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

### March–April 2014

“Chirp, Croak, Snore” (YN article with teachers guide)

[http://files.dnr.state.mn.us/mcvmagazine/young\\_naturalists/young-naturalists-article/frogs-and-toads/frogs-and-toads.pdf](http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/frogs-and-toads/frogs-and-toads.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.** Teachers guide for the Young Naturalists article “Color by Nature” by Mary Hoff. Published in the March–April 2015 *Minnesota Conservation Volunteer*, or visit [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine).

1. List at least five ways color can help plants and animals. **Colors help animals and plants either hide or be noticed. Colors can invite animals to eat plants, to pollinate the plant, or warn animals away. Colors can provide plants with food and also signal that animals need to be fed. Colors protect animals from too much sun.**

\*2. How do pigments enable us to see colors? **Pigments absorb some light waves and reflect others. We can see reflected light.**

\*3. Why do ruby-throated hummingbirds have red chins (sometimes)? **When light strikes the hummingbirds' feathers in just the right way, bubbles in the feathers change the path of red light waves, making them visible to the viewer's eye.**

4. Adaptations help living things **survive and reproduce.**

5. How do western grebe parents know when to feed their chicks? **When a spot on the chick's head turns from yellow to red, the parents know the chick is hungry.**

\*6. Would you like to be fed like a baby herring gull? Why or why not? **Answers will vary, but it's safe to assume that most students would not find eating regurgitated food appealing.**

\*7. How does color help a red-bellied snake survive? **When the snake is threatened it turns its belly toward the predator. The color startles the predator, allowing the snake to escape.**

8. The lady beetle's orange color is an example of **aposematic coloration.**

9. Give an example of "advertising coloration." **The butterfly milkweed's orange flowers tell pollinators to come for a meal.**

\*10. What do carotenoids have to do with color? **Carotenoids are a class of pigments that produce orange colors in flowers, vegetables, and fruits.**

11. When is the male goldfinch yellow? Why? **The male goldfinch is yellow in spring and summer. The yellower the color, the healthier the bird. Healthier is better if you are looking for a mate.**

\*12. Why does the male green frog have a yellow throat? **The frog's colorful throat is thought to be a warning sign to other male green frogs that the territory is already claimed. It may also be helpful in attracting a mate.**

13. The grasshopper's color helps it **hide from predators.**

14. Young common five-lined skinks have red tails. True **False**

\*15. How do black bears help blueberries survive? **Bears eat the berries, but do not digest the seeds. The seeds are dispersed in the bears' droppings.**

\*16. If you see a double-crested cormorant perched with its wings spread out, what might you conclude? **The bird is drying its feathers after diving under water for food. Its black feathers dry quickly because black absorbs sunlight.**

\*17. What times of year are weasels brown and white? Why? **Weasels are brown and white in spring and fall. That's when they are changing to and from their winter white coloration.**

18. What is "flagging," and what does it mean? **When white-tailed deer lift their tails, they expose the white fur on the tail's underside. Scientists think flagging tells predators that the deer sees them and so will be hard to catch.**

\*Challenge: This article describes 16 plant and animal color adaptations. Divide them into at least three categories based on any criteria you choose. You may make a table or chart to illustrate the categories. Explain how you divided the 16 into groups. **Answers will vary. Allow students to be creative. There are many ways to categorize the plants and animals in the article.**

**MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY.** Teachers guide for the Young Naturalists article “Color by Nature” by Mary Hoff. Published in the March–April 2015 *Minnesota Conservation Volunteer*, or visit [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine).

1. The short-tailed weasel’s pineal gland **B. changes the color of the weasel’s coat.**
2. Some flowers have pigments that **D. A, B, and C.**
3. Biliverdin is a pigment found in **B. robin eggs.**
4. Describe how pigments help plants and animals survive. **Answers will vary. Coloration helps plants and animals to reproduce, find food, escape predators, and avoid harmful ultraviolet radiation.**
5. Red-bellied snakes eat **C. slugs.**

**VOCABULARY ANSWER KEY.** Teachers guide for the Young Naturalists article “Color by Nature” by Mary Hoff. Published in the March–April 2015 *Minnesota Conservation Volunteer*, or visit [www.mndnr.gov/mcvmagazine](http://www.mndnr.gov/mcvmagazine).

**absorb** draw in

**aphid** small sap-sucking insect

**carbon dioxide (CO<sub>2</sub>)** a naturally occurring chemical compound composed of two oxygen atoms and one carbon atom

**camouflage** coloration that makes animals hard to see

**herpetologist** scientist who studies amphibians

**hibernate** spend the winter in a special kind of deep sleep

**juvenile** young animal or human, such as a teenager

**nectar** sugar-rich liquid produced by plants

**predator** animal that kills and eats other animals

**reflect** cast back light from a surface

**ultraviolet light** electromagnetic radiation that is invisible to the human eye and causes suntan and sunburn