MINNESOTA CONSERVATION VOLUNTEER

Teachers Guide

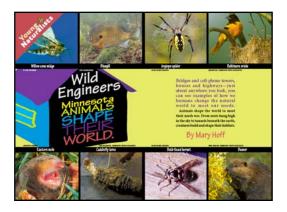
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Youngists Naturalists

"Wild Engineers: Minnesota Animals Shape Their World" Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article "Wild Engineers: Minnesota Animals Shape Their World" by Mary Hoff. Published in the November–December 2006 *Minnesota Conservation Volunteer,* or visit www.dnr.state.mn.us/young_naturalists/wild_engineers.

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 Summary "Wild Engineers" is a survey of eight animals, from arachnids to mammals, that modify their habitats to protect themselves from predators, to reproduce, or to obtain food. This article contains many excellent photos that are included in the PDF version available online. (Please note that Young Naturalists are the only *Conservation Volunteer* articles available in PDF format from the Web site.)

Suggested

reading levels: third through eighth grades

Total words: 1,259

Materials:	Paper, poster board, pencils, pens, markers, print resources from your media center, materials suitable for construction of the project described in the extension activities section.	
Preparation time:	One to two hours, not including time for extension activities	
Estimated instructional time:	Two to three 50-minute class periods (not including extensions)	
Minnesota Academic Standards applications:	"Wild Engineers: Minnesota Animals Shape Their World" 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 B. Contact and Fur Trade 1600–1810 V. Geography: Grades 4–8 D. Interconnections: The student will describe how humans influence the 	environment and are in turn influenced by it. Science Grade 3 IV. Life Science B. Diversity of Organisms C. Interdependence of Life Grade 4 IV. Life Science B. Diversity of Organisms Grade 5 IV. Life Science E. Biological Populations Change Over Time F. Flow of Matter and Energy Grade 7 IV. Life Science B. Diversity of Organisms C. Interdependence of Life E. Biological Populations Change Over Time F. Flow of Matter and Energy 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*.

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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 how organisms, including humans, change their environments to benefit themselves, 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. See www.teach-nology.com/web_tools/graphic_org/kwl for a **KWL** generator that will produce individual organizers for your students.

Vocabulary preview

You may wish to preview the attached list as well as any other words based on knowledge of your students' needs. Connections to vocabulary in the article may be made during the **KWL** activity. Ask students to highlight the italicized words. 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. Unfamiliar terms may be added to the W list as the article is 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. Study cards (Hock, Deshler, and Schumaker, 2000), can be applied to any subject area. Cut along the horizontal lines, fold in the middle, and tape or staple. 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. Blanks are provided to allow you or your students to add new words or phrases.

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 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, below). The study questions may also be used as a quiz. Note: Items 1, 4, 6, and 7 and the challenge require analytical thinking.

Adaptations Read aloud to special needs students. Abbreviate the study questions or highlight priority items to be completed first—for example, items 1, 2, 4, 7, and 10. 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.

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Assessment You may use all or some of the study questions, combined with vocabulary, as a quiz. Other assessment ideas: (1) Students may, in a brief essay, compare and contrast two of the animals' engineering strategies. (2) Students may sketch an animal in its habitat, showing how it changes that habitat to increase its chances for survival. (3) Item 2 may then be shared in poster presentations.

Extension activities Plan a field trip to your school forest or a nearby state park to observe species in the article. You may contact a park naturalist (www.dnr.state. mn.us/state_parks) for a guided tour.

- 2. Gather monofilament fishing line, string, glue, twigs, soil and water (for making mud), and newsprint, flour, and water (for making papiermâché). Ask students to build one of the structures described in the article.
- 3. Extend assessment item 1 (above) by challenging students to relate one or more of the animal structures to human environmental adaptations that serve the same or similar purposes.
- 4. Collect some galls, cut in half and examine under a magnifying glass.

Web resources

Bald-faced hornets

www.fcps.edu/StratfordLandingES/Ecology/mpages/ bald-faced_hornet.htm

Eastern mole

animaldiversity.ummz.umich.edu/site/accounts/ information/Scalopus_aquaticus.html

Bluegill

www.dnr.state.mn.us/snapshots/fish/bluegill.html

Argiope

animaldiversity.ummz.umich.edu/site/accounts/ information/Argiope_aurantia.html

Baltimore oriole

www.mbr-pwrc.usgs.gov/id/framlst/i5070id.html

Midge

weaselhead.org/profile/?s=1892

Galls

insects.ummz.lsa.umich.edu/MES/notes/entonotes2.html Beaver

www.dnr.state.mn.us/snapshots/mammals/beaver.html Caddisfly

www.fcps.edu/StratfordLandingES/Ecology/mpages/ northern_caddis_fly.htm Related Minnesota Conservation Volunteer articles (see www.dnr.state. mn.us/volunteer/articles) include: March-April 2006 "The Hole Story" (with teachers guide) November–December 2000 "The Curious World of Galls" May–June 1996 "Fish Sense" (with teachers guide) January–February 1995 "What's Making a Racket?" July-August 1995 "Eager Beavers" March-April 1994 "Baby Birds of Minnesota" January–February 1993 "Black Bear Yearbook"

- **References** 1. 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.

"Wild Engineers: Minnesota Animals Shape Their World"—Teachers Guide

Name Period Date 1. Explain how bald-faced hornets use spit to build their nests.	Study Questions "Wild Engineers: Minnesota Animals Shape Their World," by Mary Hoff <i>Minnesota Conservation Volunteer</i> , November–December 2006 www.dnr.state.mn.us/young_naturalists/wild_engineers		
2. The eastern mole digs two types of tunnels. What are they, and what are they used for?	Name	Period Date	
3. How is a mole's body adapted for digging? 4. Describe how female and male bluegills cooperate to raise their young. 4. Describe how female and male bluegills cooperate to raise their young. 5. All of the steps a garden spider follows to build a web are listed below, but not in the correct order. Number the steps in the right order: A stabilimentum is woven in the middle of the web. A single thread catches on a leaf. A thread is spun down the middle. The first thread is attached to the plant the spider is on. Dry threads are spun between the frame and the center. A frame is spun around the first two threads. A spiral of sticky threads is spun. A spiral of dry threads is spun.	1. Explain how bald-faced hornets use spi	it to build their nests	
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A spiral of dry threads is spun.	-	70 threads.	
6. Why does the spider produce two kinds of threads, dry and sticky?			
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7. How are Baltimore oriole nests different from most other birds' nests?			

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8. How does the midge larva change the way a willow grows?

Study Questions Answer Key

"Wild Engineers: Minnesota Animals Shape Their World," by Mary Hoff Minnesota Conservation Volunteer, November–December 2006 www.dnr.state.mn.us/young_naturalists/wild_engineers

- 1. Explain how bald-faced hornets use spit to build their nests. **Their saliva is like a** glue or cement that holds the wood pulp together and also attaches the nest to the tree or other support.
- 2. The eastern mole digs two types of tunnels. What are they, and what are they used for? **One is a deep tunnel, used for traveling in safety. The other is a shallow tunnel, used for finding food.**
- 3. How is a mole's body adapted for digging? Moles have front feet that face outward for moving soil. Their shoulder muscles are strong for digging. Their noses are pointed for moving soil and their ears and eyes are covered by skin to keep soil out.
- 4. Describe how female and male bluegills cooperate to raise their young. The male builds the nest; the female lays the eggs; the male fertilizes the eggs and stays near to protect them from predators and from being covered by silt.
- 5. All of the steps a garden spider follows to build a web are listed below, but not in the correct order. Number the steps in the right order:
 - 8 A stabilimentum is woven in the middle of the web.
 - **1** A single thread catches on a leaf.
 - 3 A thread is spun down the middle.
 - 2 The first thread is attached to the plant the spider is on.
 - 5 Dry threads are spun between the frame and the center.
 - 4 A frame is spun around the first two threads.
 - 7 A spiral of sticky threads is spun.
 - 6 A spiral of dry threads is spun.
- 6. Why does the spider produce two kinds of threads, dry and sticky? **The spider travels on the dry threads, while prey insects are caught in the sticky threads.**
- 7. How are Baltimore oriole nests different from most other birds' nests? **They hang down from the far tips of branches and are shaped like a pouch.**
- 8. How does the midge larva change the way a willow grows? It secretes a chemical that causes the leaves to form a cone-shaped growth called a gall.
- 9. How does the parasitoid wasp outsmart the midge? The wasp waits until the gall is formed and lays its eggs near the midge larva. The wasp larva eats the midge larva and uses the gall as a safe place to mature.
- 10. Describe the caddisfly larva's strategy for protecting itself from predators. It produces a silklike material that allows it to attach a protective coat of small stones and sticks.

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11. What is good way to identify different species of caddisfly larvae? **By examining the materials used to make their protective coating.**

Challenge: Some people destroy beaver dams. Why? **Sometimes beavers create high** water in streams and lakes and damage trees near their ponds.

Minnesota Comprehensive Assessments Practice Items

"Wild Engineers: Minnesota Animals Shape Their World," by Mary Hoff Minnesota Conservation Volunteer, November–December 2006 www.dnr.state.mn.us/young_naturalists/wild_engineers

Name	neP	eriod	_Date
А. В. С.	use small sticks and stones to build Beavers Caddisfly larvae Wasps Rhabdophaga strobiloides	a case aroun	d their bodies.
A B C.	eavers build dams in or standing water or cornfields streams or woods . standing water or streams . wetlands or hillsides		
А. В. С.	a gall is a protective shelter for an insect larvae part of an insect's body lump on a plant stem A and C		
А. В. С.	a bluegill nest might contain eggs. a. 100 or more b. 10,000 or more c. 10,000 or more c. 100,000 or more		
А. В. С.	Drioles line their nests with grass feathers hair D. all of the above		

Minnesota Comprehensive Assessments Practice Items Answer Key

"Wild Engineers: Minnesota Animals Shape Their World," by Mary Hoff Minnesota Conservation Volunteer, November–December 2006 www.dnr.state.mn.us/young_naturalists/wild_engineers

- 1. **B. Caddisfly larvae** use small sticks and stones to build a case around their bodies.
- 2. Beavers build dams in **C. standing water or streams.**
- 3. A gall is a **D**. A protective shelter for an insect larvae and **C** lump on a plant stem
- 4. A bluegill nest might contain **C. 10,000 or more** eggs.
- 5. Orioles line their nests with **D. all of the above**.

Vocabulary

"Wild Engineers: Minnesota Animals Shape Their World," by Mary Hoff Minnesota Conservation Volunteer, November–December 2006 www.dnr.state.mn.us/young_naturalists/wild_engineers

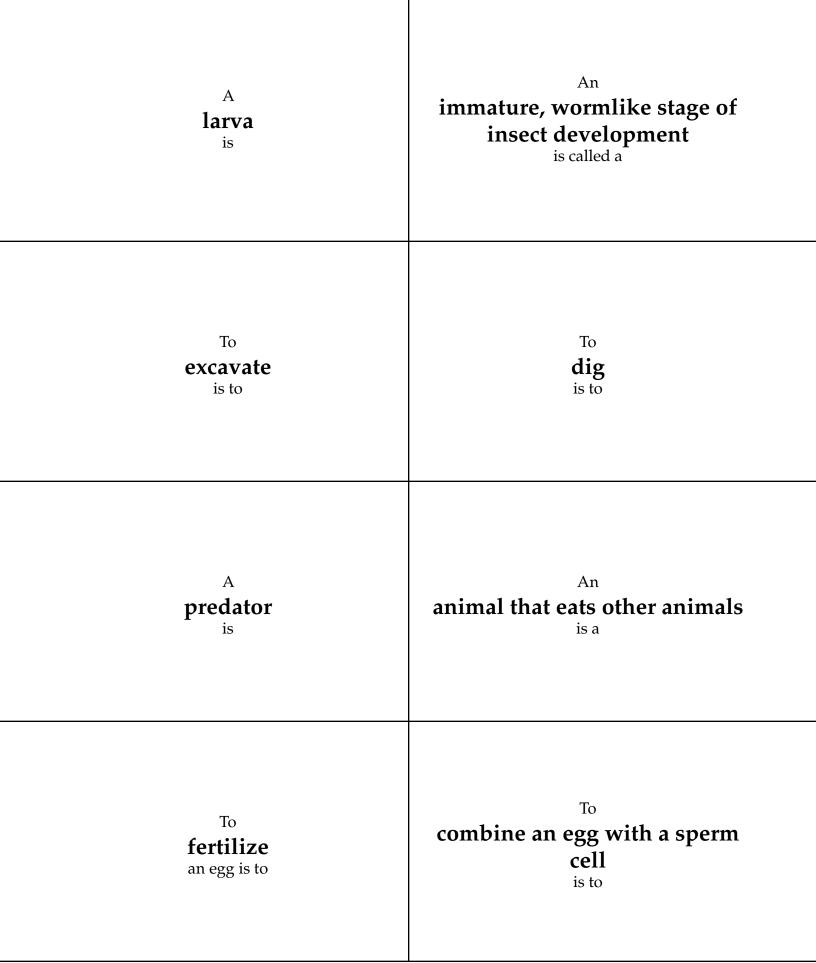
habitat	natural conditions and environment	
pulp	crushed wood	
miniature	smaller version	
larva (larvae)	immature, wormlike form of many insects	
excavate	dig	
predator	animal that eats other animals	
fertilize	to unite sperm and egg	
silt	fine soil particles	
silk	fine fibers that spiders secrete to make their webs	
spiral	to move outward in gradually increasing circles	
flexible	easily bent without damage	
pupa	insect stage between larva and adult	
salivary gland	a body part that produces saliva (spit)	

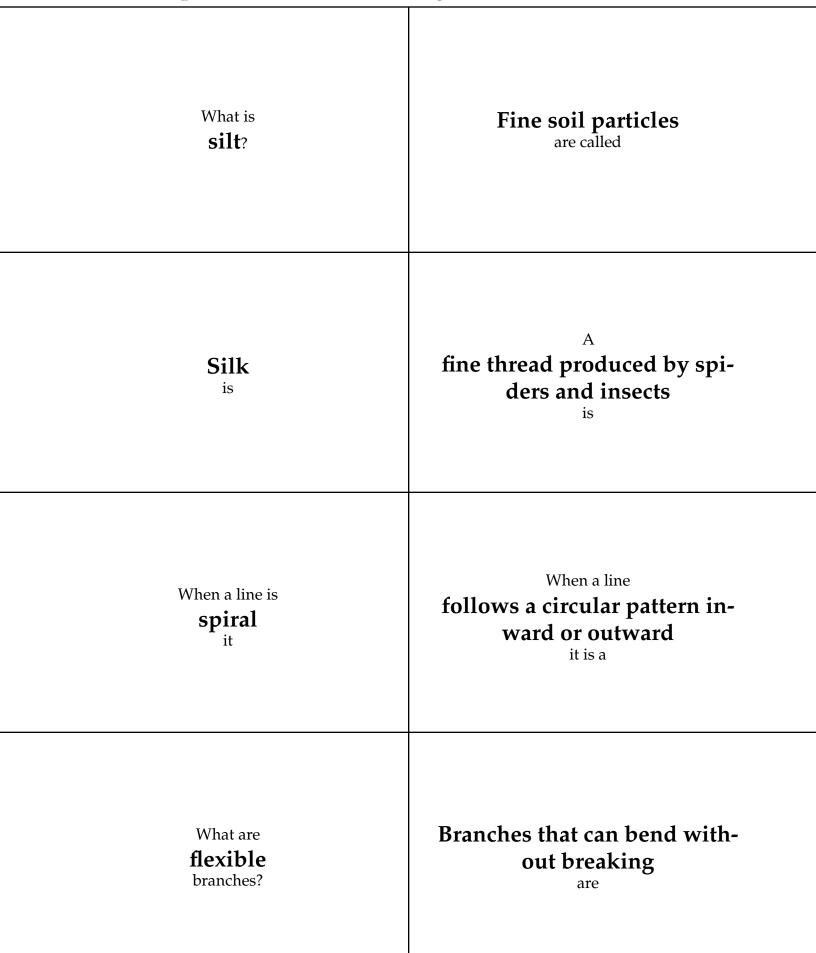
Vocabulary Study Cards

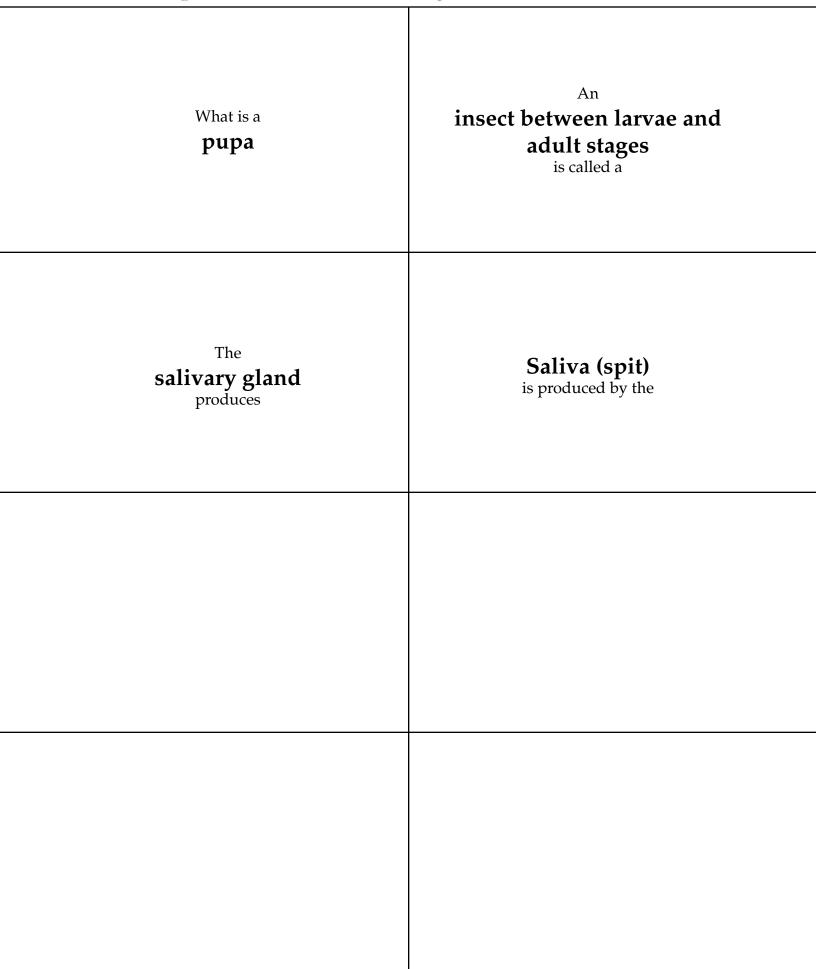
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Cut along the horizontal lines, fold in the middle and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

An object is miniature when it is a	A very small copy of a larger object is called a
What does habitat mean?	A place where a plant or animal lives is its
Wood pulp is	Ground wood fibers are called







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