YOUNG NATURALISTS

TEACHERS GUIDE

TO "WONDERFUL WASPS"

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, May–June 2017, www.mndnr.gov/mcvmagazine.

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 and click on *past issues*.

Thank you for bringing Young Naturalists into your classroom!

"Wonderful Wasps"

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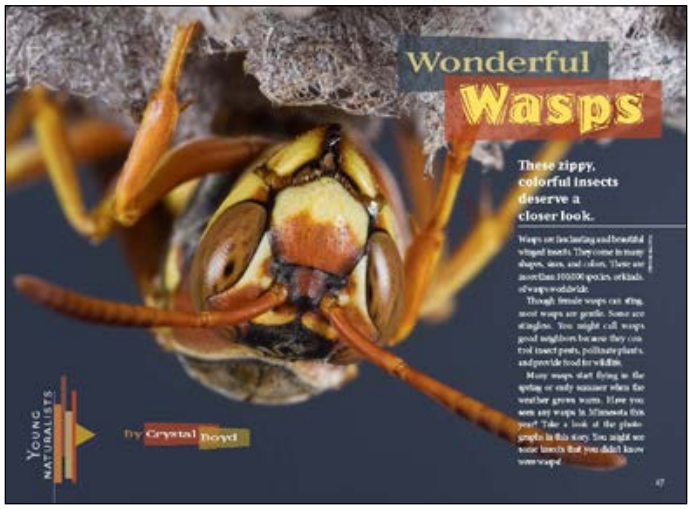

Summary. We often think of wasps as our foes, lurking underneath eaves and deck boards, waiting to sting us. In reality, they are a fascinating and valuable part of nature. This Young Naturalists feature showcases a variety of Minnesota wasps and explores their natural history and how they benefit humans.

Suggested reading levels. Third through middle school grades

Materials. KWL organizer, index cards, paper, poster board, colored pencils, crayons, pens, scented markers, YouTube videos (see Web Resources), and other 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. "Wonderful Wasps" 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 Science and Technical Subjects 6–8

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 6–8

Text Types and Purposes, Writing Process: Production and Distribution of Writing, Research to Build and Present Knowledge, Range of Writing

Mathematics 3,4,6, and 7

Geometry and Measurement
3.3.1.2; 3.3.2.2; 4.3.2.4; 5.3.1.1; 5.3.1.2; 6.3.1.1; 7.3.1.2; 7.3.2.2

Science 3, 5, and 7

Life Science
3.4.1.1.1; 3.4.1.1.2; 5.4.1.1.1; 7.4.2.1.1; 7.4.2.1.2;

Arts K–12

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

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

Preview. (1) Students likely have a lot of preconceptions about wasps—many unfavorable. You might start by showing students a wasp in a jar or an empty wasp nest and asking them what they think about wasps. Talk about similarities and differences between wasps and other common insects such as ants and mosquitoes. Brainstorm ways in which wasps might be beneficial. (2) You might follow with a **KWL** activity. To find out what your students already know (**K**) about wasps, divide the class into small groups to brainstorm their ideas. Give each student a copy of the organizer (see www.teach-nology.com/web_tools/graphic_org/kwl.) and encourage each to make notes during the group discussion. Ask what students would like to learn, or what questions they have, about wasps (**W**). Record their questions on poster board for reference. As you read and discuss the article you will begin to compile the (**L**) lists, 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 or art class, you may wish to focus your prereading activity on academic standards that apply for that class.

Vocabulary preview. You can find a copy-ready vocabulary list at the end of this guide. Feel free to modify it to fit your needs. Share the words with your students and invite them to

guess what they think they mean. Tell them you will be reading a story that will help them understand these words so they can "own" and use them in the future!

You might wish to use the study cards (adapted from Strategic Tutoring) found at the end of the Study Questions for this Young Naturalists feature. On one half of the card, in large letters, is a key vocabulary word or phrase with smaller letters framing the word or phrase in a question or statement. On the other half is the answer to the question or the rest of the statement. Cut along the horizontal line, fold in the middle, and tape or staple, then use like flash cards. We've included a few blanks so you or your students can add new words or phrases if you'd like.

Study questions overview. Preview the study questions with your class before you read the article. Then read the story aloud. Complete the study questions in class, in small groups, or as an independent activity, or use them as a quiz.

Adaptations. Read aloud to special needs students. Abbreviate the study questions or focus on items appropriate for the students. Adapt or provide assistance with extension activities as circumstances allow.

Assessment. You may use all or part of the study guide, combined with vocabulary, as a quiz. Other assessment ideas include: (1) Ask students to describe what they learned about wasps. See the "learned" list from your **KWL** activity. (2) Have students write multiple-choice, true-false, or short-answer questions based on the article. Select the best items for a class quiz. (3) Posters and presentations are an excellent strategy for allowing students to demonstrate what they have learned.

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. Join University of Minnesota Extension's Wasp Watcher Program (see "Resources"). Follow linked websites to explore the reason behind the wasp watch. Then, as a class, search for nests of the smoky winged beetle bandit wasp. Learn what else you can do to help minimize the impact of emerald ash borer in Minnesota.
2. Why are the individual chambers in wasp nests shaped like hexagons? The answer lies in efficiency—getting the most space for the least amount of material. Do online research to learn about the mathematics behind the strategy, then create a poster or demonstration to share your knowledge with classmates. You can also use this as a launch point to explore the mathematical concept of tiling.
3. Yellowjackets and paper wasps make their nests by chewing wood into pulp, mixing it with spit, then depositing it in thin layers to create individual chambers for their larvae. You can make paper, too! Follow the "Make Your Own Paper" instructions on the Environmental Education for Kids! website to turn pulp into paper (starting with scrap paper so you don't have to chew wood into pulp).

4. Choose two of the wasps featured in the story. Use library and internet sources to learn more about them. Create a table or chart comparing and contrasting various characteristics.
5. Social wasps communicate with each other through the use of pheromones, chemicals that one wasp gives off and another senses. Explore the various kinds of messages wasps convey using pheromones. What are the advantages of using chemicals rather than other ways of communicating? Use a scented marker (or use other scents) to create a scent scavenger hunt for your students. Create a key indicating the message conveyed by each scent, then plant scented cues at various stations to lead them to a treasure.
6. People sometimes spray pesticides to kill wasps that are harming or threatening to harm people. Research how the pesticides work. What do they do to other living things? How can we best protect ourselves against problem wasps without hurting other wasps and other living things?
7. Invite students to put together a "Teenage Mutant Ninja Wasp" lineup of superheroes based on Minnesota wasps. What powerful traits would they give to each?
8. Play "You Are the Queen," a simple online game that takes players through the various choices a bald-faced hornet queen faces as she works to successfully fledge young over the course of a year. Which choices lead to success? Which choices doom the colony?
9. Scientists who study wasps are called entomologists. Explore entomology as a career. How does a person become an entomologist? And what do entomologists do with the knowledge they gain? Carly's Adventures in Wasp Land provides a taste of what entomology is all about.

Web Resources

General Teacher and Student Resources

Minnesota DNR Teachers' Resources
DNR Kids Page

Wasps

Wasp Watcher Program
Solitary Wasps
Minnesota Bee Atlas
Cedar Creek Ecosystem Science Reserve Insect Photo Album
Social Wasps and Bees in the Upper Midwest

Social Insects

Social Insects: Bees, Wasps, Ants and Termites (Teacher Resource Guide)

Videos

Paper wasp building next and feeding larvae
National Geographic: Body Invaders (caterpillar parasite, not for the squeamish)
National Geographic: Parasitic Wasps (aphid parasite)

Online Games and Activities

You Are the Queen (players build a wasp colony and try to successfully make it through a year)
Carly's Adventures in Wasp Land (cartoon series exploring social and parasitoid wasps written and drawn by an entomologist)

Study questions answer key

1. List three reasons why wasps are good to have in your neighborhood. **They control insect pests, they pollinate plants, they provide food for wildlife**.
2. How many? A typical wasp has **3** main body parts, **6** legs, **4** wings, and **2** antennae.
3. True or false: Bees have fuzzy bodies and heads, while wasps are hairless. **False. Even Though wasps look smooth and bald, if you look closely you can see that they have hairs**.
4. Name two things yellowjacket nests and paper wasp nests have in common, and two ways they differ. **Answers may vary. Things in common include: they are made of paper, their cells have six sides, and they hold a group of relatives and a queen. Differences: Yellowjacket nests are large and hold hundreds or thousands of wasps, while paper wasp nests are small and hold 50–60 wasps. Yellowjacket nests are round, while paper wasp nests are curved with an open bottom**.
5. True or false: bees and wasps are natural enemies. **False. Like good neighbors, bees and wasps can live next to each other**.
6. What happens to male wasps and female workers when summer is over? **They die from cold**.
7. What do fertilized social wasp eggs become? **Female wasps**. What do unfertilized eggs become? **Male wasps**.
8. How do some wasps help protect garden plants? **They hunt insects that hurt garden plants**.
9. Which of the following does the story tell us eat wasps or wasp larvae?
a. emerald ash borers
b. bears
c. skunks
d. spiders
e. raccoons
f. b, c, and e
10. True or false: It hurts more to get stung by a male bee than to get stung by a female bee. **False. Male bees don't sting**.
11. Name three situations in which a wasp might sting you. **If you provoke it, if you appear to be threatening its nest, if it gets stuck in your clothing**.
12. Which kind of wasp is most likely to sting you?
a. male wasps
b. social wasps
c. solitary wasps
Challenge: The article lists several things various kinds of wasps eat. Name three of

them. **Answers may vary but may include caterpillars, grubs, flies, katydids, yellowjackets, spiders, tree crickets, soybean aphids, metallic wood-boring beetles, and emerald ash borers**.

Minnesota comprehensive assessments answer key.

1. The article tells us that wasps come in many different sizes, shapes and colors. Name at least three things all wasps have in common. **Answers may vary. Traits mentioned in the article include: they are a type of insect; they have three main body parts, six legs, four wings, and two antennae; they are carnivores**
2. How do wasps' and bees' diets differ? **Wasps eat meat and bees are vegetarians**.
3. Name three kinds of social wasps. **Yellowjackets, paper wasps, bald-faced hornets**
4. True or false: Minnesota has more wasps than hornets. **True. Minnesota has no true hornets**.
5. Another name for paper wasp is **umbrella wasp**.
6. What happens to male wasps and female workers in late fall? **They die from cold**.
7. Which of the following is not part of the wasp life cycle?

pupae
adults
eggs
prepupae
pulp
larvae

8. List four ways pollinators help people. **They protect crops and gardens by eating harmful insects, they help control insects that harm ash trees, they provide food for wildlife, they help plants reproduce by spreading pollen**.

Vocabulary list

antennae long, thin body parts that extend from an insect's head and help it sense its environment
aphids tiny insects that drink sap
beneficial helpful
document provide evidence for
invasive spreading rapidly through an area
pulp bits of wood that have been broken down
fertilized combined with sperm from a male
provoke stir up