

Teachers Guide

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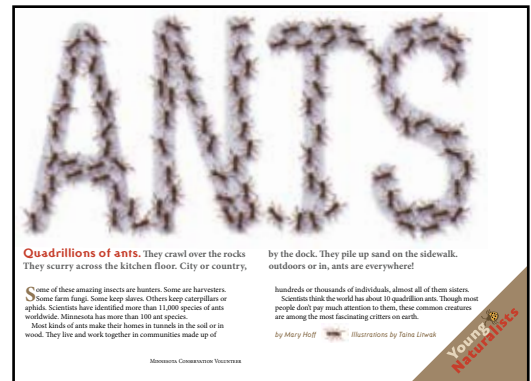
“Ants”

Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article “Ants” by Mary Hoff. Illustrations by Taina Litwak. Published in the May–June 2007 *Minnesota Conservation Volunteer*, or visit www.dnr.state.mn.us/young_naturalists/ants.

This guide contains a brief summary of the article, suggested independent reading levels, word count, 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. Please note if you are downloading Conservation Volunteer articles from the Web site that only Young Naturalists articles are available in PDF.



Summary

“Ants” introduces the reader to one of the most prolific life forms on Earth. The text, which is accompanied by illustrations of an ant colony and ant anatomy, describes how ants establish new colonies, reproduce, find and manage their food supply, and start more colonies.

Suggested reading levels:

fifth grade through high school

Total words:

1,362

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Materials: Paper, poster board, pencils, pens, markers, and print resources from your media center, Internet information sources, magnifying glasses or microscopes, ant farm materials (See Web resources.)

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

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

Minnesota Academic Standards applications: “Ants” 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

V. Geography

Grades 4–8

- D. Interconnections: The student will give examples that demonstrate how people are connected to each other and the environment.

Mathematics

Grade 6

II. Number Sense, Computation, and Operation

- B.8. Find, represent and use percentages in real-world math problems.

Grade 7 (A.2.) and Grade 8 (A.3.)

II. Number Sense, Computation, and Operation

- A. Use scientific notation with positive and negative powers of 10.

Science

Grade 5

IV. Life Science

- E. Biological Populations Change Over Time

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

Arts

Artistic Expression: Visual Arts

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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 and photos. Use the **KWL** strategy (Ogle, 1986) to find out what your students already know (**K**) about ants, 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). 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. **KWL** also gives you the opportunity to introduce interdisciplinary connections you will make during extension activities. For example, if you plan to use the article during mathematics, science, or art you might ask students to review their **KWL** for concepts that are specific to those disciplines. **Note:** Students will need to understand scientific notation and how to calculate percentages in order to complete the study questions.

Vocabulary preview “Ants” includes many challenging terms, making a thorough vocabulary preview essential to your students’ understanding and appreciation of the article. If you have not recently studied insects, begin your review with insect characteristics (invertebrate with three body segments, two antennae, and three pairs of legs). Unless anatomy is included in your curriculum you need not preview the terms on pages 32 and 33 (they are not included in the preview list or on study cards).

Connections to vocabulary in the article may also 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 they read the article. Eventually they can be moved to the **L** list. You might write vocabulary from the article in green ink, while other ideas are written in black. **Note:** Some of the words in the vocabulary list definitions may require further explanation.

You might wish to use the study cards found at the end of this guide. Cut along the horizontal lines, 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. Blank cards are provided to allow you or your students to add new words or phrases.

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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). The study questions may be also used as a quiz. **Note:** Items 1, 2, 3, 4 13, 14, and the Challenge require varying degrees of analytical thinking.

Adaptations

Read aloud to special needs students. Abbreviate the study questions or highlight priority items to be completed first, for example, items 2, 3, 7, 10, and 12. If time allows, remaining items may be attempted. For the sketch in item 9 you may provide an unlabeled drawing to students who are unable to draw, or ask a peer helper to make the sketch. 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: (1) Students may write an essay describing a typical day in the life of a worker ant. (2) Students may sketch one or more ant species. (3) Poster presentations may illustrate how ants are an important part of our environment. (4) If your classroom has an ant farm, students might make systematic observations to document ant behavior.

Extension activities

1. Build or buy an ant farm or dig up a colony (see page 36). Ask students to observe and document how the colony changes over several weeks. Take photographs to help students check their notes for accuracy.
2. Students can use “Ants” as a starting point for an exploration of other social insects, such as bees and termites. Some interesting possibilities include comparing and contrasting ants to other superorganisms with respect to behavior, diet, habitat, and reproductive cycles. What are the advantages and disadvantages of social organizations? The study of ants led to a new branch of biology called sociobiology. Challenge your students to find commonalities between ant and human societies. See Web resources.
3. Advanced students will enjoy *Journey to the Ants*, by Bert Hölldobler and E.O. Wilson. Adapted from the Pulitzer Prize-winning *The Ants, Journey to the Ants* is an excellent introduction to myrmecology (the study of ants). Chapter three, “The Life and Death of the Colony,” gives students a more detailed account of the colony and will enhance poster sessions or essays.
4. Younger students may read *City Under the Back Steps*, by Evelyn Sibley Lampman and Honore Valintcourt. This book is out of print but still available at many libraries and from used booksellers. A fantasy about

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children, shrunk to ant-size, who join a colony under their back steps, it would be a good read-aloud to accompany your ant farm or other social insect studies.

5. In spring and fall, short field trips will give students the chance to observe the four common ant species pictured in the article, as well as other insect species. Students may document location of colonies as well as distinctive behaviors of each species. Data gathered on field trips can be compared to ant farm observations. Genus and species names for the ants on pages 34 and 35 can be used to introduce your students to taxonomy, the science of naming and classifying plants and animals. See Web resources for information on insect taxonomy.
6. Ants in Minnesota are relatively benign. Not so in other parts of the world. Your students may be surprised to learn that fire ants and army ants pose serious threats to animals and people. With Web resources students may create posters or movie scripts that illustrate how dangerous (and disastrous) some ants can be.
7. Connect this article to your math curriculum through the conversion of very large numbers or very small numbers from standard to scientific notation. See janus.astro.umd.edu/astro/scinote for some introductory exercises.

Web resources

Ant farms

www.allfreecrafts.com/nature/ant-farm.shtml
www.wonderbrains.com/ant-farms.html
www.fi.edu/tfi/units/life/habitat/habact2.html

Social insects

www.ndsu.nodak.edu/entomology/topics/societies.htm
ai-depot.com/Essay/SocialInsects.html
es.rice.edu/projects/Bios321/eusocial.insect.html

Taxonomy

www.einsteins-emporium.com/life/animal-info/insects/taxonomy.htm
www.kendall-bioresearch.co.uk/class.htm
www.earthlife.net/insects/classtax.html

Fire ants/army ants

ipmworld.umn.edu/chapters/lockley.htm
www.insecta-inspecta.com/ants/army
www.projects.ex.ac.uk/bugclub/raiders.html

Scientific notation

www.nyu.edu/pages/mathmol/textbook/scinot.html

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Many related *Minnesota Conservation Volunteer* articles are available online at www.dnr.state.mn.us/volunteer/articles including:

July–August 2000

“Katydid’s”

www.dnr.state.mn.us/volunteer/julaug00/katydid.html

November–December 2000

“The Curious World of Galls”

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

May–June 2005

“Six-Spotted Tiger Beetle (*Cicindela sexguttata*)”

www.dnr.state.mn.us/volunteer/mayjun05/mpbeetle.html

July–August 2004

“Mustard Eaters”

www.dnr.state.mn.us/volunteer/julaug04/fngarlicmustard.html

July–August 2004

“Buggy Sounds of Summer,” (with study guide)

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

November–December 2006

“Wild Engineers” (with study guide)

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

March–April 2004

“Special Delivery” (with study guide)

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

July–August 2006

“Regal Fritillary (*Speyeria idalia*)”

www.dnr.state.mn.us/volunteer/julaug06/mp.html

References

1. Hock, M.F., Deshler, D.D., and Schumaker, J.B. *Strategic Tutoring*. Lawrence, Kan.: Edge Enterprises, 2000.
2. 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.
3. Hölldobler, B., and E. O. Wilson. *Journey to the Ants*. Cambridge, Mass.: Belknap Press, 1994.
4. Lampman, E. S., and H. Valintcourt. *City Under the Back Steps*. New York, N.Y.: Doubleday, 1960.

Study Questions

“Ants” by Mary Hoff. Illustrations by Taina Litwak
Minnesota Conservation Volunteer, May–June 2007
www.dnr.state.mn.us/young_naturalists/ants

Name _____ Period _____ Date _____

1. Write the number quadrillion in standard notation. _____
How is it written in scientific notation? _____
2. Where are ants found? _____
3. How do ants make a living? _____

4. What percentage of species of ants estimated to be found on Earth live in Minnesota? _____

5. Most ants are: male _____ female _____
6. How many ants are estimated to be living on Earth? _____
7. Describe how ants begin a new colony. _____

8. How are worker ants different than male ants? _____

9. See the illustration on pages 32 and 33. Make a sketch of a carpenter ant. Now label the antennae, head, mesosoma, waist, gaster, and legs. For extra credit include at least four other body parts of your choice?

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10. Match the body part with its function or purpose.

Hairs	Grasp, cut, dig
Legs	Sense motion
Mandibles	Clean antennae
Antennae	Sense its environment
Eyes	Taste, smell and feel

11. Using a key characteristic, identify the ant species on pages 34 and 35.

Characteristic

Genus/Species Name

Larvae stick together

Aphid farmers

Cheese eaters

Caterpillars' friend

12. Ants use several methods of communication. Describe two. For extra credit include a third.

13. Explain how ants benefit the natural environment. Include at least one example of a symbiotic relationship. _____

14. What is anting, and why might it be important? _____

Challenge: Find out more about pheromones. What are they? What do they do? What can you add to the information in this article? _____

Study Questions Answer Key

“Ants” by Mary Hoff. Illustrations by Taina Litwak

Minnesota Conservation Volunteer, May–June 2007

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

1. Write the number quadrillion in standard notation **1,000,000,000,000,000**
How is it written in scientific notation? **1×10^{15}**
2. Where are ants found? **All over Earth**
3. How do ants make a living? **Ants are hunters, gatherers, and farmers.**
4. What percentage of species of ants estimated to live on Earth live in Minnesota?
100 of 11,000 = 0.9%
5. Most ants are: male female
6. How many ants are estimated to be living on Earth? 10,000,000,000,000 (10 quadrillion)
7. Describe how ants begin a new colony. **Answers will vary, but should include the queen flying and mating during flight, digging a hole and laying eggs, feeding the larvae, and then laying more eggs that are cared for by workers.**
8. How are worker ants different than male ants? **Worker ants are female. They do the work of the colony (caring for young, gathering food, expanding the nest). Male ants leave the nest to find new queens.**
9. See the illustration on pages 32 and 33. Make a sketch of a carpenter ant. Now label the antennae, head, mesonoma, waist, gaster, and legs. For extra credit include at least four other body parts of your choice. **Stress accuracy over realism.**
10. Match the body part with its function or purpose.
Hairs, **Sense its environment**
Legs, **Clean antennae**
Mandibles, **Grasp, cut, dig**
Antennae, **Taste, smell and feel**
Eyes, **Sense motion**
11. Using a key characteristic, identify the ant species on pages 34 and 35.

<u>Characteristic</u>	<u>Genus/Species Name</u>
Larvae stick together	<i>Camponotus pennsylvanicus</i>
Aphid farmers	<i>Lasius neoniger</i>
Cheese eaters	<i>Solenopsis molesta</i>
Caterpillars' friend	<i>Tetramorium caespitum</i>
12. Ants use several methods of communication. Describe two. For extra credit include a third. **Tapping, stridulation, pheromones.**

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13. Explain how ants benefit the natural environment. Include at least one example of a symbiotic relationship. **Answers may vary, but may include: controlling other insect populations, keeping soil healthy, breaking down dead trees, and helping propagate plants (symbiosis).**
14. What is anting, and why might it be important? **Some birds allow ants to crawl on their feathers. Answers may vary.**

Challenge: Find out more about pheromones. What are they? What is their purpose? What can you add to the information in this article? **Pheromones are chemical communicators. See Web sites for additional information.**

Minnesota Comprehensive Assessments Practice Items

“Ants” by Mary Hoff. Illustrations by Taina Litwak

Minnesota Conservation Volunteer, May–June 2007

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

Name _____ Period _____ Date _____

1. _____ tell ants where to find food.
 - A. Anting
 - B. Pheromones
 - C. Ant farmers
 - D. Aphids

2. Ten quadrillion is an estimate of
 - A. the number of ants on Earth.
 - B. the number of aphids in ant colonies.
 - C. the number of ant colonies in Texas.
 - D. the number of queen ants on Earth

3. Unfertilized eggs become
 - A. queen ants.
 - B. worker ants.
 - C. male ants.
 - D. bird food.

4. The correct sequence is
 - A. egg, larvae, adult, pupae.
 - B. larvae, egg, pupae, adult.
 - C. egg, pupae, larvae, adult.
 - D. egg, larvae, pupae, adult.

5. Ants use their mandibles to
 - A. produce chemicals.
 - B. fight other ants.
 - C. carry objects.
 - D. B and C.

Minnesota Comprehensive Assessments Practice Items Answer Key

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1. **B. Pheromones** tell ants where to find food.
2. Ten quadrillion is an estimate of **A. the number of ants on Earth.**
3. Unfertilized eggs become **C. male ants.**
4. The correct sequence is **D. egg, larvae, pupae, adult.**
5. Ants use their mandibles to **D. B and C.**

Vocabulary

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aphids	insects with special mouth parts for sucking sap from plants
fertilized	uniting of sperm and egg
fungi	organisms without chlorophyll that reproduce with spores and absorb nutrients from other organisms
harvester	gathers food
insects	air-breathing invertebrates with three body segments, two antennae, three pairs of legs, and often two sets of wings
invertebrate	lacking a backbone or spinal column
larvae	wingless, immature form of many insects before developing into pupae
nectar	sweet liquid that flowering plants produce to attract insects and birds
nutritious	food that promotes good health
pileated woodpecker	crow-sized black and white woodpecker found in wooded areas of North America
predators	organism that kills and eats other organisms

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pupae	insect stage between larvae and adult
quadrillion	1 followed by 15 zeroes
species	organisms that resemble one another and may interbreed
sterile	unable to reproduce
symbiosis	beneficial relationship

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Vocabulary Study Cards

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Minnesota Conservation Volunteer, May–June 2007

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

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.

A
quadrillion
equals

The number
1,000,000,000,000,000
equals a

What are
insects?

**Organisms with three main
body parts, two antennae, and
six legs**
are

A
harvester
is one who

**One who
gathers food**
is a

What are
fungi?

What are
**organisms without
chlorophyll that reproduce
with spores**
called?

What are
aphids?

**Insects that suck sap from
plants**
are called

A
species
is made up of

Members of a
**group of organisms that
look alike and can produce
offspring together**
make up

An egg is
fertilized
when

When
a sperm unites with an egg,
the eggs has been

Larvae
are

What are
**insects in the second stage of
insect development**
called?

Pupae
are

What are
**insects in the third stage of
insect development**
called?

When an organism is
sterile
it

When an organism
cannot reproduce,
it is

Nectar
is a _____
that _____

A
**sweet liquid that attracts
birds and insects**
is called

What are
predators

What are
**animals that kill and eat other
animals**
called?

A
pileated woodpecker
is a

A
**crow-sized bird found in
wooded habitats of North
America**
is a

Symbiosis
describes

A
**beneficial relationship
between two organisms**
is called

Nutritious
food is

Food that is
good for your health
is

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An
invertebrate
organism has

An
**organism with
no backbone**
is an

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