

Teachers Guide

Prepared by “Ask a Rock” Multidisciplinary Classroom Activities

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Teachers guide for the Young Naturalists article “Ask a Rock” by Mary Hoff. Published in the January–February 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/rocks

Young Naturalists teachers guides are provided free of charge to classroom teachers, parents, and students. 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 Minnesota 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 to suit user needs. Users are encouraged to provide feedback through an online survey at www.mndnr.gov/education/teachers/activities/ynstudyguides/survey.html.

New digital archives: All *Minnesota Conservation Volunteer* articles published since 1940 are now online in searchable PDF format. Visit www.mndnr.gov/magazine and click on *past issues*.

Summary

“Ask a Rock” describes 12 rocks commonly found across Minnesota. Each rock is identified by its mineral composition, geologic history, commercial uses and location in the state. Photos and maps accompany the text and will help students with study guide activities. Several supplemental teacher resources are listed on page 11.

Suggested reading levels:

third through middle school grades

Total words:

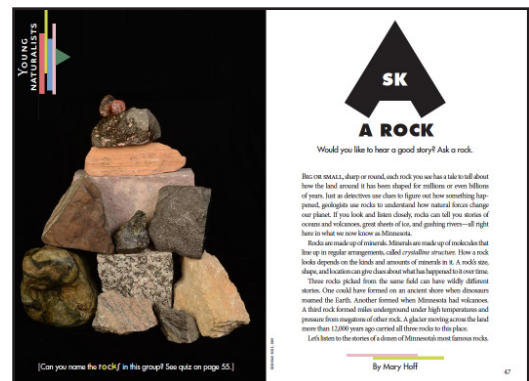
1,781

Materials:

Geology of Minnesota: A Guide for Teachers (files.dnr.state.mn.us/lands_minerals/geologyhandbook.pdf), collection of assorted rocks, paper, poster board, colored pencils, crayons, pens, markers

Preparation time:

One to two hours, not including time for extension activities



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Estimated instructional time:

One or two 50-minute class periods (not including extensions)

Minnesota Academic Standards Applications:

“Ask a Rock” 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

Grades 3, 4, 5, 6

Number and operation
3.1.2.4; 4.1.1.6; 4.1.2.5; 5.1.1.1;
5.1.1.2; 5.1.1.3; 5.1.1.4; 6.1.3.1;
6.1.3.4

Science

Grades 4, 5, and 8

Earth and Space Science
4.3.1.3.1; 4.3.1.3.2; 5.3.1.2.1;
5.3.1.2.2; 5.3.4.1.2; 8.3.1.1.1;
8.3.1.2.1; 8.3.1.2.2
8.3.1.3.1; 8.3.1.3.2; 8.3.1.3.3

Social Studies

Grades 4, 5, and 6

Geography
4.3.1.2.1; 4.3.4.9.1; 5.3.4.10.1;
6.3.4.10.1

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. Teachers who find other connections to standards are encouraged to contact *Minnesota Conservation Volunteer*.

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Preview If possible, assemble a collection of rocks of the types featured in the article. Give a different rock to small groups of students. Ask each group to list as many characteristics of its rock as possible. After a few minutes bring the groups together to compare and contrast their lists. Post the lists in the room for reference as you read and discuss the article and participate in the activities. For a second or alternative preview activity, post a geologic time line with the names of the rocks in the article attached. Ask students to examine the time line and to pose questions that may be answered by the article. Another strategy for accessing prior knowledge is a brainstorming web. You may download a printable web at www.teachervision.fen.com/tv/printables/TCR/0743932080_007.pdf.

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 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. 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). 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 compare and contrast two of the rocks in the article. Compare and contrast is a good strategy for assessing students’ understanding of the natural forces that formed the rocks in the article. See compare and contrast tools in Web resources. (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 rocks or class of rocks. (4) Ask students to construct their own geologic timelines.

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Extension activities

1. “Rocky Roots,” “Mirrors of Minnesota,” and “Agate Hounds,” all Young Naturalists articles with teachers guides, makes excellent companion pieces for “Ask a Rock.” See Related Articles for links.
2. Encourage students to collect and bring in rock samples for a class collection.
3. Provide index cards for students to make flashcard decks of the rocks. Make copies of the article so students can attach photos to one side of their cards.
4. Challenge students to find out more about the science of geology and/or Minnesota’s mining history. Connect historical issues regarding environmental concerns to current events. See Web resources for links to mining for precious metals in northern Minnesota and for silica sand (used in hydraulic fracturing) in southern Minnesota. Challenge students to evaluate environmental and industry arguments against and for expanded mining in Minnesota.
5. If possible, take a field trip to a state park or scientific and natural area. DNR naturalists will work with you to design activities related to academic standards.
6. Ask students to write the names of the rocks in the article on a Minnesota map. You may wish to create a poster-size map. See Web resources for map link.

Web resources

Geology

www.dnr.state.mn.us/education/geology/digging/index.html
www.dnr.state.mn.us/snapshots/rocks_minerals/lakesuperioragate.html
www.dnr.state.mn.us/education/geology/digging/rocksmin.html
www.dnr.state.mn.us/education/geology/digging/detectives.html
www.dnr.state.mn.us/education/geology/digging/fossils.html
images.dnr.state.mn.us/education_safety/education/geology/digging/gtt6.gif
www.dnr.state.mn.us/education/geology/digging/stateparks.html
www.kidsgeo.com/geology-for-kids/0019-inside-of-earth.php
free.ed.gov/subjects.cfm?subject_id=141
scienceforkids.kidipede.com/geology/

Mining in Minnesota

www.dnr.state.mn.us/education/geology/digging/taconite.html
www.dnr.state.mn.us/education/geology/digging/history.html
www.dnr.state.mn.us/education/geology/digging/mining.html
www.friends-bwca.org/issues/sulfide-mining
www.startribune.com/local/130508938.html?refer=y
www.miningminnesota.com
www.miningtruth.org/sulfide-mining-minnesota
www.taconite.org

Silica Sand Mining

www.dnr.state.mn.us/lands_minerals/silicasand.html
minnesota.publicradio.org/display/web/2012/10/03/one_on_one_silica_sand_mining
www.geo.msu.edu/geogmich/sand.html
www.co.scott.mn.us/ParksLibraryEnv/Environment/EnvReview/DocumentsEnvironmental%20SCENE%20Apr%20May%202012.pdf

Compare and Contrast

www.readwritethink.org/files/resources/interactives/compcontrast/
www.manatee.k12.fl.us/sites/elementary/samoset/rcccon1.htm
www.readingquest.org/strat/compare.html

Minnesota Map Outline

geography.about.com/library/blank/blxusmn.htm

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Web resources **Minnesota DNR Teacher Resources**

www.mndnr.gov/education/teachers/index.html

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.

January–February 1989

“Buried Treasure: The Search for Mineable Metals in Minnesota”

https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=285

September–October 1995

“Rocky Roots”

www.dnr.state.mn.us/young_naturalists/rockyroots/index.html (YN article with teachers guide)

March–April 2002

“Geological Wonders”

https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=579

November–December 2002

“Conservation Careers”

www.dnr.state.mn.us/young_naturalist/careers/index.html (YN article with teachers guide)

September–October 2003

“Mirrors of Minnesota”

www.dnr.state.mn.us/young_naturalists/symbols/index.html (YN article with teachers guide)

March–April 2008

“Drop into History”

https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=3592

July–August 2011

“Agate Hounds”

www.dnr.state.mn.us/young_naturalists/agates/index.html (YN article with teacher guide)

July–August 2012

“Digging Into the Promise of Copper”

www.dnr.state.mn.us/volunteer/julaug12/nonferrous.html

References

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

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Study Questions

Teachers guide for the Young Naturalists article “Ask a Rock” by Mary Hoff. Published in the January–February 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/rocks

1. When the writer uses the phrase “natural forces,” what do you think she means? _____

2. What are rocks made of? _____

3. How could several rocks, each formed in a different place, all end up in your back yard? _____

4. Gneiss was formed from what other common Minnesota rock? _____

5. When quarried, gneiss may be used for _____

6. Greenstone was formed 2.7 billion years ago. Write the standard form for 2.7 billion: _____

7. Why might greenstone be mined? _____

8. Quartzite has been compared to what food? Why? _____

9. What is magnetite? Why do you think it got its name? _____

10. Compare and contrast iron ore and taconite. _____

11. What national monument used Minnesota granite? _____

12. How is gabbro similar to granite? _____

13. Basalt was formed 1.1 billion years ago. Write 1.1 billion in expanded form:

14. Why do you suppose the agate was chosen as Minnesota's state gemstone? _____

15. Sandstone was formed one-half billion years ago. Express the number one-half billion in millions: _____

16. Compare and contrast sandstone and limestone. _____

Challenge: Sort the rocks in the article into two or more categories. What makes each category unique? Do you think there is more than one way to create categories? _____

Study Questions Answer Key

Teachers guide for the Young Naturalists article “Ask a Rock” by Mary Hoff. Published in the January–February 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/rocks

- *1. When the writer uses the phrase “natural forces,” what do you think she means? **Answers will vary. She gives clues in the first paragraph of the story: water, ice, volcanoes.**
2. What are rocks made of? **Rocks are made of minerals.**
3. How could several rocks, each formed in a different place, all end up in your back yard? **They were carried and deposited by glaciers. (They also could have been carried in by a landscaping truck.)**
- *4. Gneiss was formed from what other common Minnesota rock? **granite.**
5. When quarried, gneiss may be used for **the construction of buildings and monuments.**
- *6. Greenstone was formed 2.7 billion years ago. Write the standard form for 2.7 billion: **2,700,000,000**
7. Why might greenstone be mined? **It may contain valuable metals such as copper, zinc, or gold.**
8. Quartzite has been compared to what food? Why? **Quartzite has been compared to ham, because it is a similar pink color.**
- *9. What is magnetite? Why do you think it got its name? **Magnetite is an iron-rich mineral. Answers may vary for the second part of the question. Students may make the connection between the words magnetite and magnet. Iron is attracted to magnets.**
- *10. Compare and contrast iron ore and taconite. **Answers will vary. Both contain iron, but in lesser concentrations in taconite. Both are found on the iron ranges of Minnesota. Both have been mined. Taconite requires processing before it is shipped to steel mills.**
11. What national monument used Minnesota granite? **Minnesota granite was used in the Statue of Liberty.**
- *12. How is gabbro similar to granite? **It was formed in a similar way.**
- *13. Basalt was formed 1.1 billion years ago. Write 1.1 billion in expanded form: **1,000,000,000 + 100,000,000**
- *14. Why do you suppose the agate was chosen as Minnesota’s state gemstone? **Answers will vary.**
- *15. Sandstone was formed one-half billion years ago. Express one-half billion in millions: **five hundred million or 500 million or 500,000,000**
- *16. Compare and contrast sandstone and limestone. **Answers will vary. Both are sedimentary. They are made of different materials. Limestone is a valuable commercial material.**
- **Challenge:* Sort the rocks in the article into two or more categories. What makes each category unique? Do you think there is more than one way to create categories? **Answers will vary. Encourage students to make as many sets of categories as possible.**

*Question involves critical thinking

Minnesota Comprehensive Assessments Practice Items

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Name _____ Period _____ Date _____

1. Forestville/Mystery caves were formed in _____.

- A. granite
- B. limestone
- C. basalt
- D. sandstone

2. Holes in basalt allowed _____ to form.

- A. agates
- B. gneiss
- C. schist
- D. limestone

3. Plagioclase and pyroxene are two minerals found in _____.

- A. basalt
- B. gabbro
- C. sandstone
- D. gold

4. Describe the forces that formed quartzite. _____

5. Rainbow granite is another name for _____.

- A. taconite
- B. greenstone
- C. polished gneiss
- D. quartzite

Minnesota Comprehensive Assessments Answer Key

Teachers guide for the Young Naturalists article “Ask a Rock” by Mary Hoff. Published in the January–February 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/rocks

1. Forestville/Mystery caves were formed in **B. limestone**.
2. Holes in basalt allowed **A. agates to form**.
3. Plagioclase and pyroxene are two minerals found in **B. gabbro**.
4. Describe the forces that formed quartzite. **Quartzite was formed when water washed sand into large deposits on the sea floor, where it formed sandstone. Sandstone was pushed underground, where heat and pressure turned it into quartzite.**
5. Rainbow granite is another name for **C. polished gneiss**.

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Vocabulary

Teachers guide for the Young Naturalists article “Ask a Rock” by Mary Hoff. Published in the January–February 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/rocks

calcium carbonate	a chemical compound that is the main component of seashells, eggshells, and pearls
element	a pure chemical substance, consisting of one type of atom
meander	follow a twisting route
megaton	one million tons, a huge amount
mineral	inorganic (not plant or animal) substance; mined substance
molecule	two or more atoms held together by covalent chemical bonds
mottled	marked with an irregular pattern of colors
natural forces	forces of nature that humans cannot control, such as volcanoes, earthquakes, weather, the sea
olivine	magnesium iron silicate, as a gemstone called peridot
plagioclase	important mineral in the feldspar family; also found on the moon
pyroxene	mineral often found in volcanic lava

Vocabulary Study Cards

Teachers guide for the Young Naturalists article “Ask a Rock” by Mary Hoff. Published in the January–February 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/rocks

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.

What is
calcium carbonate?

FOLD HERE

A chemical compound that is the main component of seashells, eggshells, and pearls is called

An **element** is a

FOLD HERE

A pure chemical substance, consisting of one type of atom is an

To **meander** is to

FOLD HERE

To follow a twisting route is to

A **megaton** is

FOLD HERE

One million tons, or a huge amount, is a

What is a **mineral**?

FOLD HERE

An **inorganic (not plant or animal) substance, or mined substance**, is called a

A **molecule** is

FOLD HERE

Two or more atoms held together by covalent chemical bonds is called a

What does **mottled** mean?

FOLD HERE

An object that is **marked with an irregular pattern of colors** is

What are **natural forces**?

FOLD HERE

Forces of nature that humans cannot control, such as volcanoes, earthquakes, weather, and the sea, are often called

What is **olivine**?

FOLD HERE

Magnesium iron silicate, as a gemstone called peridot, is called

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What is
plagioclase?

FOLD HERE

An important mineral in the feldspar family that is also found on the moon is called

Pyroxene is

FOLD HERE

A mineral often found in volcanic lava is called

FOLD HERE

FOLD HERE

FOLD HERE