

TEACHERS GUIDE

TO “THE GLACIER DID IT”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, November–December 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 Naturalists 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. The magazine is entirely financially supported by 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!

“THE GLACIER DID IT”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, March–April 2018, www.mndnr.gov/mcvmagazine.



SUMMARY. Many of Minnesota’s lakes, hills, ridges, and other geographic features were made by glaciers that covered the land thousands of years ago. This Young Naturalists article depicts and describes seven such features: kettle lakes, eskers, moraines, drumlins, glacial striations, glacial erratics, and glacial lakes. It is a particularly good fit for 8th grade earth and space science standards.

SUGGESTED READING LEVELS. Third through middle-school grades

MATERIALS. KWL organizer, technology for showing online videos, materials for creating reports, technology for accessing internet resources and related MCV content, other print and online resources your media specialist may provide. Check “Extension Activities” section below for material needs for add-on activities.

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. “The Glacier Did It” 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

SCIENCE 3, 4, 5, 7 AND 8

The Nature of Science and Engineering

3.1.3.2.1; 5.1.1.1.1

Physical Science

4.2.3.2.1; 5.2.2.1.2

Interactions Among Science, Technology Engineering, Mathematics, and Society

3.1.2.2.1; 3.1.3.2.2; 3.1.3.4.1

Earth and Space Science

4.3.1.3.1; 5.3.1.2.1; 5.3.1.2.2; 5.3.4.1.1; 5.3.4.1.2; 5.3.4.1.3; 8.3.1.2.1; 8.3.1.2.2; 8.3.4.1.2

Life Science

5.4.2.1.2; 5.4.4.1.1; 7.4.4.1.2

SOCIAL STUDIES 3,4,5 AND 6

Geography

4.3.2.3.1; 4.3.4.9.1; 5.3.4.10.1; 6.3.3.6.1

ARTS K–12

1. Artistic Foundations: Visual Arts
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) You might start by briefly introducing Minnesota’s glacial history. See “Web Resources” below for videos you can use for background. (2) Follow with a KWL activity focused on the landforms Minnesota’s glaciers left behind. To find out what your students already know (K) about glacial landforms, 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 the topic (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 the words mean. Tell them you will be reading a story that will help them understand these words so they can 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 glacial landforms. 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. (4) To add variety and give students a chance to practice diverse skills, consider using variations on traditional ways of reporting, such as having students interview each other, make mobiles displaying various facts about glacial landforms, produce audio or video recordings of their report, or create a web page about their subject.

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. Do some research to identify glacier-related landforms in your area. Share their stories with your students, then take a field trip to see them. During your visit, have students sketch, write poems or narratives, take photos, or otherwise bring creative arts into the process of exploration.
2. Use the Minnesota Science Teachers Education Project "[Ice Cream Model—How Glaciers Formed the Minnesota Landscape](#)" to demonstrate glacial action using ice cream and other edibles. Discuss, as you do the activity, how what you're observing ties in to the various formations described in the article.
3. The Minnesota Geological Survey offers publications, tours, field trips and educational presentations on a wide variety of topics. Contact the MGS at mgs@umn.edu or 512-626-2969 to learn about opportunities that might be available for your students.
4. When and why was Minnesota home to glaciers? Did anything live here then? Use books, websites and interviews with experts to learn about the origin and fate of glaciers that carved the landforms we see today.
5. Among the natural resources the glaciers left behind are massive beds of gravel. Look into Minnesota's gravel industry. Where is gravel mined? What is it used for? What happens to gravel mines once the gravel is removed? How does gravel mining affect the plants and animals that live in the area? What do people do to minimize the harm?
6. How do we know how long ago glaciers were here? Look into the science of dating rocks and landforms.

WEB RESOURCES

GENERAL TEACHER AND STUDENT RESOURCES

[Minnesota DNR Teachers' Resources](#)

[DNR Kids Page](#)

BACKGROUND ON GLACIATION

[Geology of Minnesota: A Guide for Teachers \(Minnesota DNR\)](#)

[Minnesota's Glacial Story \(video\)](#)

[Glaciers and Minnesota \(video\)](#)

[Animation of Glaciation in Minnesota \(slide show\)](#)

[Ancient Glaciers Shaped These Twin Cities. Here's How \(Pioneer Press article\)](#)

RELATED MCV ARTICLES

[Geological Wonders \(MCV article on geology in state parks\)](#)

[Roving Boulders \(MCV article on glacial erratics\)](#)

[Giants of the Ice Age \(Young Naturalists article on Ice Age life\)](#)

[Minnesota's Rocky Roots \(Young Naturalists article on Minnesota's geological history\)](#)

[Glacial Hills \(MCV article on Glacial Lakes State Park\)](#)

[Gravel: Gift of the Glaciers \(MCV article on gravel and gravel mining\)](#)

STUDY QUESTIONS ANSWER KEY

1. True or false? Glaciers seem to be moving, but in reality they stay in one place. **False. Glaciers move slowly as snow and ice pile up and push down on them.**
2. What is glacial till? **Till is the sand and gravel glaciers carry with them and leave behind when they melt.**
3. How did most of Minnesota's lakes form? **Most of Minnesota's lakes formed as chunks of ice left behind by glaciers and covered by sand and gravel melted, leaving depressions where they once were.**
4. What do eskers tell us?
 - a. where we might find snakes if we look under rocks
 - b. where rivers once ran beneath glaciers**
 - c. where glaciers stopped advancing
 - d. how long glaciers covered Minnesota
5. What do terminal moraines tell us?
 - a. where glaciers stopped advancing**
 - b. where the beaches of glacial lakes were located
 - c. where we should build airport terminals
 - d. how many times glaciers advanced and retreated
6. Name four places in Minnesota where you can see moraines. **Along the north shore of Lake Superior, in the middle of the state, in southwestern Minnesota, in southeastern Minnesota.**
7. How might a drumlin provide a clue as to which direction the glacier that formed it was traveling? **Some drumlins are shaped like water drops with the narrow part pointing in the direction the glacier traveled.**
8. Striations are caused by **rocks carried frozen into the glacier** scraping against bed-rock.
9. How are erratics useful to geologists trying to piece together Minnesota's past?
 - a. They provide clues as to what kind of rock is beneath the soil in a particular place.
 - b. They provide clues as to which direction the glacier that carried it was moving.
 - c. They provide reference samples for local studies.
 - d. They provide clues as to where the glacier came from.
 - e. a and c
 - f. b and d**
10. What is Lake Agassiz? **A huge lake that formed after the glaciers melted in northern Minnesota.**
11. Name three clues scientists have found that hint at Lake Agassiz's past existence? **Three of the following: ridges of sand where the beaches once were; flat, rich soils in the Red River Valley; peatlands; Upper and Lower Red Lake.**
12. True or false: Glaciers once covered all of Minnesota. **False. Parts of southeastern Minnesota escaped glaciation.**

Challenge: The glacial erratic in the photo on page 37 look like a large sphere split in half. If it's 10 feet high, what would be the approximate volume of both halves put together? **The formula for the volume of a sphere is $\frac{4}{3}\pi r^3$ where r is radius (1/2 diameter). $\frac{4}{3} \times 3.14 \times 5^3 = 523$. Approximate volume would be 500 cubic feet.**

MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY.

1. How are land features shaped by glaciers like cups, plates, and food left over after a party? Answers may vary. **Some possibilities: They are additions to the scene that weren't there before; they indicate that something happened that isn't happening any more; they provide clues as to the nature of the event that took place; they seem scattered about but their locations tell us something about what happened.**

2. Why are eskers shaped like snakes?

a. because they were formed by rivers that were curved

b. because glaciers moved like snakes as they moved across the land

c. because they were built by ancient people who liked snakes

d. because they are filled with snakes

3. What is the difference between a terminal moraine and a ground moraine? **A terminal moraine forms at front edge of a glacier. A ground moraine forms beneath a glacier.**

4. Why might the part of a glacier that touches the land beneath it be liquid? **The movement of the glacier against the land causes it to warm and melt.**

5. What does it mean to say that mounds, piles, and pits have stories to tell? **These landforms do not literally talk, but they provide hints of what has happened that we can use to paint a picture of past events.**

VOCABULARY LIST

bedrock the rock that forms the base of a place, upon which soil, plants, etc., build up
equivalent more or less the same

friction the force of one thing moving against another

gouge [n] a dug-out place

remnants things that are left behind

ridge a strip of higher than the surrounding land

vast very large