

TEACHERS GUIDE

TO “THUNDER ON THE PLAINS”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, September–October 2019, 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!

“THUNDER ON THE PLAINS”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, September–October 2019, www.mndnr.gov/mcvmagazine.



SUMMARY. Bison were a key part of the prairie ecosystem for millennia until humans hunted them to the edge of extinction. This Young Naturalists feature explores the life of bison, their place in history and in the prairie, and efforts to boost their populations in Minnesota and beyond.

SUGGESTED READING LEVELS. Third through middle school grades

MATERIALS. KWL organizer; optional resources include dictionaries, art supplies, Internet access and other print and online resources your media specialist may provide.

PREPARATION TIME. 15–30 minutes, not including time for extension activities

ESTIMATED INSTRUCTION TIME. 30–60 minutes, not including extension activities

MINNESOTA ACADEMIC STANDARDS APPLICATIONS. “Thunder on the Plains” activities described below may be used to support some or all of the following Minnesota Department of Education standards for students in grades 3–8:

SCIENCE (*CODING IS BASED ON JUNE COMMISSIONER APPROVED DRAFT OF MN ACADEMIC STANDARDS IN SCIENCE)

Strand 2 Looking at Data and Empirical Evidence to Understand Phenomena or Solve Problems (Benchmark 7L.2.1.1.1)

Strand 3 Developing Possible Explanations of Phenomena or Designing Solutions to Engi-

neering Problems (Benchmarks 4E.3.1.1.1, 5L.3.1.1.3, 6E.3.2.1.3)

Strand 4 Communicating Reasons, Arguments and Ideas to Others (Benchmarks 3L.4.1.1.1, 3L.4.2.1.1, 4E.4.2.1.1, 4E.4.2.2.1, 5L.4.1.2.1, 7L.4.1.2.1, 7L.4.1.2.2)

MATH

Data Analysis (Benchmarks 3.4.1.1, 4.4.1.1., 5.4.1.2)

Algebra (Benchmark 5.2.1.1)

SOCIAL STUDIES

Citizenship and Government (Benchmark 6.1.5.10.1)

History (Benchmarks 3.4.1.2.1, 3.4.1.2.2, 5.4.4.16.2, 6.4.4.16.1)

Geography (Benchmarks 4.3.1.2.1, 4.3.4.9.1, 6.3.4.10.1)

ARTS

Artistic Process: Create or Make (Benchmark 0.2.1.3.1)

ENGLISH LANGUAGE ARTS

Reading Benchmarks: Informational Text

Key Ideas and Details (Benchmarks 3.2.1.1, 3.2.3.3, 4.2.1.1, 4.2.3.3, 5.2.1.1, 5.2.3.3, 6.5.1.1, 7.5.1.1, 8.5.1.1)

Craft and Structure (Benchmarks 3.2.4.4, 4.2.4.4, 4.2.6.6, 5.2.4.4, 5.2.6.6, 6.5.4.4, 7.5.4.4, 8.5.4.4)

Integration of Knowledge and Ideas (Benchmarks 3.2.8.8, 4.2.7.7, 4.2.9.9, 5.2.7.7, 5.2.9.9, 6.5.9.9, 7.5.9.9, 8.5.9.9)

Writing Benchmarks

Text Types and Purposes (Benchmarks 3.6.2.2, 4.6.2.2, 5.6.2.2, 6.7.1.1, 7.7.1.1, 8.7.1.1)

Research to Build and Present Knowledge (Benchmarks 3.6.7.7, 4.6.7.7, 5.6.7.7, 6.7.7.7, 7.7.7.7, 8.7.7.7)

Speaking, Viewing, Listening and Media Literacy Benchmarks

Comprehension and Collaboration (Benchmarks 3.8.1.1, 4.8.1.1, 5.8.1.1, 6.9.1.1, 7.9.1.1, 8.9.1.1)

Language Benchmarks

Vocabulary Acquisition and Use (Benchmarks 3.10.4.4, 4.10.4.4, 5.10.4.4, 6.11.4.4, 6.11.6.6, 7.11.4.4, 7.11.6.6, 8.11.4.4, 8.11.6.6)

Reading Benchmarks: Literacy in Science and Technical Subjects

Key Ideas and Details (Benchmark 6.13.1.1)

Writing Benchmarks: Literacy in Science and Technical Subjects

Research to Build and Present Knowledge (Benchmark 6.14.7.7)

For current, complete Minnesota Academic Standards, see www.education.state.mn.us. Teachers who find other connections to standards may contact *Minnesota Conservation Volunteer*.

PREVIEW. Do a [KWL activity](#). Divide students into small groups. Within the groups, have students describe what they already know (K) about bison and what they wonder (W) about them. 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. As you read and discuss the article you can compile a list of what they learn (L) while reading the article and related materials and participating in extension activities. If appropriate for your students, watch an introductory video such as [Meet the American Bison!](#) for younger students or [Return of the American Bison](#) for older students to provide an overview of the topic.

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 you 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 use them in the future! As your students encounter these vocabulary words in the story, you may want to encourage them to infer meaning using context clues, such as other words in the sentence or the story's illustrations. Students also could be encouraged to compare their inferences as to what the words mean with their earlier guesses and with the definitions from the vocabulary list.

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 with smaller letters framing the word 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 bison. 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) Have students create posters, podcasts, or videos to share their new knowledge about bison with others.

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. This story starts in the 1500s with Spanish explorer Coronado's discovery of bison, but bison's connection with humans far older. Take a deeper dive into the relationship between Native Americans and bison. What role have bison played in the lives of Native Americans over time? What role do they play today? Older students could be encouraged to compare and contrast information from different sources regarding the role of the bison historically and today in the lives of Native Americans.

2. Bison are part of ecosystem. Use information from the article as well as other sources to create a list of plants and animals that thrive around and on bison. For each of these plants and animals, describe how they benefit from bison and/or how bison benefit from them. Have students visually depict the ecological importance of the bison, illustrating how the bison is connected to other prairie plant and animal species. Students also could be asked to create a model of these interactions among the bison and other prairie wildlife, along with interactions among other living and nonliving components of the prairie ecosystem. Older students could be asked to create an electronic visualization (simulation or animation) of the movement of matter among prairie plants, bison, decomposers, and the environment.

3. Bison, cattle, sheep, and goats are all ruminants. Learn about the common characteristics of this group. Many members of this group are domesticated. What makes them particularly valuable to humans?

4. A gathering of bison is called a herd. A gathering of songbirds is called a flock. Look into the "group names" of different kinds of animals. Now get creative! What would you call a gathering of 2-year-olds? A gathering of earthworms? Invite students to make up their own group names and draw a picture to illustrate it. Students could use this group naming exercise as a starting point for looking more at the group behavior of bison, and how being part of a group helps animals obtain food, defend themselves, and even cope with change. Students can use this information to construct a written argument about the group behavior strategies bison use to survive.

5. Bison once numbered in the millions but almost became extinct in the 19th century. Put on your CSI hats and dig into the reasons behind their demise. Why were they able to thrive over thousands of years of Native American hunting? Why did they suddenly start to disappear when European settlers arrived? This could lead to discussions regarding how humans modify the physical environment and how they are in turn affected by these modifications. If appropriate for your students, introduce the concept of resilience and tipping points. These concepts could extend into further discussion and research regarding how communities, including Tribal communities, use evidence and scientific principles to make decisions about the uses of natural resources. Older students could be asked to read from additional resources regarding bison conserva-

tion efforts and evaluate the merit of current or proposed conservation “solutions” to the problem of bison population decline. Older students also could be asked to apply scientific principles to design a method for monitoring and minimizing human impact on current bison populations. A related extension might entail locating Minnesota and U.S. maps that show historic prairie ranges, and then using this information alongside bison population data to look for patterns in the data and consider the meaning of those patterns, as well as possible relationships between resource availability and populations of organisms in an ecosystem. Data from the maps and/or population data could be converted by students into bar graphs or frequency tables. Are there other species whose decline coincides with the decline of the range of the prairie?

6. The title of this story is *Thunder on the Plains*. Discuss what that refers to—the deep, storm-like sound thousands of bison made as they ran across flat land. Experiment with various materials to make percussion instruments that can evoke the sound of so many hooves hitting the earth. Orchestrate a performance of “Thunder on the Plains” with your students using their invented instruments.

7. People often refer to the American bison as “buffalo.” Put on your detective hats and use the Internet and other resources to find out what buffalo are and how the name came to be used for the American bison.

8. The American bison was named the United States’ national mammal in 2016. Research the history and significance of other national symbols. Discuss the value of designating national symbols. Are there any downsides?

9. Look at pictures of bison and camels. What similar external physical characteristic do they have in common? (A hump). Research and discuss how this physical characteristic has a different function. Do bison and camels share other characteristics? Are they in the same kingdom? Phylum? Class? Order? Family? Genus? Species? Students could be asked to obtain further information about a bison’s hump (or another internal or external characteristic of the bison) and use that information to support a written argument regarding how the hump (or other internal or external structure) supports bison survival, growth, or behavior.

10. The article states that 500 years ago, when the Europeans arrived in North America, there were tens of millions of bison. Do you think it is possible for someone to have counted that many, or how might they have estimated population size? Hunt around online to find some firsthand accounts of the number of bison there were many years ago (e.g., John James Audubon or Peter Fidler for starters). How accurate do you think these written accounts or artwork were? Compare and contrast two different accounts regarding bison populations during the same historical time period. How do wildlife biologists count bison today?

11. The article mentioned that the Native Americans hunted bison on foot with spears and arrows. What about a bison’s physical and behavioral characteristics would make hunting them with a spear both difficult and dangerous? What other strategies were used to hunt bison before guns and horses were introduced? Encourage library and/or internet research to further investigate advances in Native American hunting technolo-

gies (tools, strategies) and use that as a launching point for discussing what “technology” means. This research also could be used as a starting point for discussions regarding ways in which European settlement of Minnesota helped and harmed Native Americans living during that time. Older students could be asked to analyze multiple accounts by Native American and non-Native American cultures of the impacts of European settlement of Minnesota, noting similarities and differences in the points of view.

12. Encourage further investigation of how dried bison patties (dung) were used long ago for cooking and warmth by those who traveled across or settled the prairie. Then research current use of dry manure fuel, as well as how manure biogas is being used to make electricity. Have students read and interpret multiple sources toward describing how energy and fuel from this natural resource (bison patties) or domesticated animal manure affects the environment in positive and negative ways.

WEB RESOURCES

GENERAL TEACHER AND STUDENT RESOURCES

[Minnesota DNR Teachers' Resources](#)

[DNR Kids Page](#)

RELATED MCV ARTICLES

[Home on the Plains](#)

[Remnants of Prairie Past](#)

GENERAL BURYING BEETLE INFORMATION

[American Bison](#)

[Bison ... Into the Wild!](#)

[Kids Page – American Bison](#)

[15 Facts About Our National Mammal: The American Bison](#)

VIDEO

[Finding Minnesota: Minneopa Bison At Minnesota State Park](#)

[Bison Roundup at Blue Mounds State Park](#)

[Return of the American Bison](#)

STUDY QUESTIONS ANSWER KEY

1. Name four animals that once lived, but no longer live, alongside bison. **Mammoths, camels, giant ground sloths, saber-toothed cats.**

2. In what century did bison almost become extinct?

a. 17th

b. 18th

c. **19th**

d. 20th

3. Bison are in the same family as cattle, sheep, and goats. List six traits these four kinds of animals have in common. **Answers will vary, but may include: are grazers; have long legs; have split hooves; have large, flat teeth; are mammals; have hair; chew their cud; give milk; are eaten by people.**

4. How did thick fur and wide horns help ancient bison survive? **The fur kept them warm and the horns helped them fight off saber-toothed cats.**

5. What do wild bison mainly eat?

a. **grasses and sedges**

b. mammoths and ground sloths

c. hay

d. trees and shrubs

6. What is rumination? **The process bison use to get nutrition out of their food. A bison swallows food, then microorganisms and acids start to break it up. Then it spits up the food and chews it.**

7. Why do bison roll on the ground? **To get rid of insects that are bothering them and to cool their bodies with mud.**

8. Name three ways in which bison help keep the prairie healthy. **Answers may vary but might include: They boost biodiversity by clearing places for flowers to sprout among the grasses. They create diverse habitat by creating wallows that fill with rainwater. They provide food for insects, worms, and fungi, which in turn provide food for birds. They become food for wolves, vultures, and other scavengers.**

9. List the season (spring, summer, fall, winter) for each event or activity:

Bison rub against trees and rocks to peel off their itchy fur. **Spring**

Bison mate. **Summer**

Bison grow fatter and put on extra layers of fur. **Fall**

Bison move less than in other seasons. **Winter**

Bison calves are born. **Spring**

Bison calves sprout horns and a hump. **Spring–Summer**

Male bison fight over females. **Summer**

Bison begin looking for each other. **Spring**

10. Put these events in order from oldest to newest: [Mary: scramble for students]

The last wild bison was seen in southwestern Minnesota

The last ice age ended

There were tens of millions of bison in North America
Bison from the Bronx Zoo were sent to Blue Mounds State Park
William T. Hornaday found bison were almost gone
Bison first moved into North America
Native people obtained horses and guns from Spanish settlers
A small group of people worked to save America's wild bison

11. Why did bison almost become extinct?
- a. Horses and guns allowed people to kill more bison than they could with spears and arrows.
 - b. Horses and cattle competed for grass and cattle made bison sick.
 - c. Settlers and railroads used their lands for other purposes.
 - d. People were allowed to shoot as many bison as they wanted.
 - e. All of the above.**
12. The title of this story is "Thunder on the Plains." What "thunder" does this refer to?
- a. Thunder from the rainstorms that provide water for wallows.
 - b. The sound of hoofbeats as bison stampede across the grasslands.**
 - c. The sound a bison's stomach makes as it digests tough grasses.
 - d. The sound of hunters shooting bison.

CHALLENGE: Tallgrass prairie once covered some 18 million acres of Minnesota, one-third of the state. About how many acres total is Minnesota? **$18 \times 3 = 54$ million acres**

MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY.

1. Why did Native American people stop hunting bison? **Because bison became extremely rare after other hunters and settlers brought in guns, horses, and cattle that made it easier to kill bison and harder for bison to find food, and because soldiers and others were allowed to shoot every bison they saw.**
2. Why does a bison have a hump on its back? **The hump contains thick muscles that hold the head in place and allow it move the head from side to side. It is so large because there's a lot of head to hold!**
3. Name three kinds of grasses and sedges bison are likely to find in tallgrass prairie. **Answers may include big bluestem, prairie dropseed, sideoats grama, porcupine grass, prairie sedge.**
4. Why did Native American people hunt bison? **They used parts of them for glue, clothing, ropes, boat lining, tipis, tools, and bowstrings. (Presumably they also used the meat for food, but the article doesn't specifically mention this.)**
5. What "lessons for the future" does the story of the bison carry? **Answers may vary but may include: Abundance is not a guarantee of future abundance; animals can become extinct if we're not careful; a small group of concerned people can turn a bad situation around.**
6. True or false: Only adult male bison have horns. **False. The article shows at least one picture of a female with horns, and notes that young bison sprout horns in late summer.**

VOCABULARY LIST

agile – able to move easily and quickly

camouflage – a disguise that helps an object blend in with its background

conserve – protect for the long term

grazer – an animal that eats plants

massive – huge and heavy

resource – something that meets a living thing's needs

taxidermist – a person who preserves animal parts for display or study

tendons – ropelike structures inside the body that connect muscles with body parts and help them move.