

TEACHERS GUIDE

to “ON PINS AND NEEDLES”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, May-June 2024, 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 words, 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 mndnr.gov/mcvmagazine and click on *past issues*.

Thank you for bringing Young Naturalists into your classroom!

“On Pins and Needles”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, July-August 2024, mndnr.gov/mcvmagazine.



SUMMARY. While most of the 2000 species of cactus are found in warm regions of North and South America, there are species that grow in Minnesota! "On Pins and Needles" introduces Young Naturalists to these three cactus species, how they survive in dry places, and why they live in Minnesota's southwestern prairie lands.

SUGGESTED READING LEVELS. Third through middle school grades

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

PREPARATION TIME. 10–15 minutes, not including time for extension activities.

Estimated instruction time. 30–60 minutes, not including extension activities.

MINNESOTA ACADEMIC STANDARDS APPLICATIONS. “On Pins and Needles” 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:

WRITING BENCHMARKS (GRADES 3-8)

Text Types and Purposes (Benchmarks 3.6.1.1., 4.6.1.1., 5.6.1.1., 6.7.1.1.)

Research to Build and Present Knowledge (Benchmarks 3.6.7.7, 4.6.7.7, 5.6.7.7, 6.7.7.7, 6.7.8.8, 7.7.7.7, 7.7.8.8, 8.7.7.7)

LANGUAGE BENCHMARKS GRADES 3-8)

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: Informational Text

Key Ideas and Details (Benchmarks 3.2.1.1, 3.2.2.2, 3.2.3.3, 4.2.1.1, 4.2.2.2, 4.2.3.3 5.2.1.1, 5.2.2.2, 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, 4.2.5.5, 5.2.4.4, 5.2.5.5, 6.5.4.4, 7.5.4.4, 8.5.4.4)

Integration of Knowledge and Ideas (Benchmarks 3.2.7.7, 4.2.7.7, 4.2.9.9, 5.2.7.7, 5.2.9.9, 6.5.7.7)

SPEAKING, VIEWING, LISTENING AND MEDIA LITERACY (GRADES 3-8)

Comprehension and Collaboration (Benchmarks 3.8.1.1, 3.8.3.3, 4.8.1.1, 5.8.1.1, 6.9.1.1, 7.9.1.1, 8.9.1.1)

Presentation of Knowledge and Ideas (Benchmarks 3.8.4.4, 4.8.4.4., 5.8.4.4, 6.9.4.4, 7.9.4.4, 8.9.4.4)

SCIENCE (*CODING IS BASED ON THE 2019 COMMISSIONER APPROVED DRAFT OF MN ACADEMIC STANDARDS IN SCIENCE)

SCIENCE AND ENGINEERING PRACTICES

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

CROSS CUTTING CONCEPTS

6. Structure and function
7. Stability and change

DISCIPLINARY CORE IDEAS

Life Sciences 1: From molecules to organisms: Structures and processes

Earth and Space Sciences 3: Earth and human activity

Engineering, Technology, and the Application of Science: 1: Engineering design

Engineering, Technology, and the Application of Science 2: Links among Engineering, Technology, Science, and Society

SOCIAL STUDIES

Geography (Benchmarks 4.3.1.1.1, 4.3.4.9.1, 4.3.4.10.1, 5.3.1.1.1, 6.3.1.1.1, 7.3.1.1.1)

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

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Preview. What do your students already know about cacti? Give them a chance to share their thoughts and observations. Then, divide them into small groups to do a KWL activity. Give each student a copy of the organizer (see teach-nology.com/web_tools/graphic_org/kwl/). Within the groups, have students describe what they already know about cacti and what they wonder about them and encourage each to write down their thoughts on the organizer. As you read and discuss the article and carry out extension activities, they can then record what they learn. If you'd like to try something different, you might wish to check out the [THC and KLEW](#) frameworks.

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.

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.

ASSESSMENT. You may use all or part of the study guide, combined with vocabulary, as a quiz. Other assessment ideas include: (1) Have students write multiple-choice, true-false, or short-answer questions based on the article. Select the best items for a class quiz. (2) Have students create a table, with three columns (for the three cactus species featured in the story) and 5 rows (blossoms, stem, spines, where it can be found; Interesting fact). Then ask students to complete the table, using information from the story.

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. While we may not often pause to realize it, plants are an important part of our everyday lives. Not only do they add beauty to our surroundings, plants provide food, fiber, medicines, and even fuel. Invite students to investigate how people have used the prickly pear cactus (for food, medicine and beyond!). Students can contribute what they learned through their research to generate a collective list. Using that list, ask students to cluster uses into categories and create a concept map of prickly pear cactus contributions.

2. Show students a picture of Qatar's [Minister of Municipal Affairs & Agriculture](#). Qatar has a hot desert climate with only about 3 inches of rain a year. With inspiration from cacti adaptations, Qatar constructed this building to be very efficient in the desert environment. With inspiration from the adaptations described in the Young Naturalists story, invite students to design a building of their choosing (a house, hotel, store, etc.) and then communicate how the different features relate to how cacti are specially designed to thrive in hot, dry environments. Or they could choose another plant to inspire their architectural design.

3. [Using a map](#), ask students to indicate where the three species of cacti are found, by shading the relevant locations on the map, with a different color for cactus species. Students should add a legend to their map, as well as the other "TODALS" map basics (title, orientation, date, author, legend and scale). Students can use the internet to find the locations of the three protected places featured in the story and label these places on their map..

4. Invite students to choose one of the three places featured in the story (Blue Mounds State Park, Pipestone National Monument, or Big Stone National Wildlife Refuge) and learn more about it through internet research. Then ask students to create a travel brochure highlighting what makes that place special and suggestions for visitors regarding interesting things to see and do (don't forget to highlight cactus viewing!). Older students can learn more about the state and federal agencies that manage these places and compare and contrast their approaches to managing natural resources and recreation.

5. Students can also learn more about the legacy of public land in Minnesota through reading the Young Naturalist story [Rich in Beauty](#) the legacy of John Latsch—a Winona businessman and early proponent of public land. Invite students to think about the benefits of public land, from the perspective of cactus and other plant conservation to other benefits and values. Students can also extend their thinking about public land by learning about their local public land. If available, invite a local public land manager

to share more about the story of public land near you. Then using what they learned through their research and thinking, ask students to construct an argument in favor of or against public land conservation, including clear reasons and relevant evidence to support their argument.

6. Invite students to recall from the story (or find in the story) the person who helped shape the author’s interest in nature. Students can be prompted to think about and share people in their own lives who have helped them notice nature around them!

7. The story describes cacti adaptations, including the thick, waxy skin, which seals water inside while allowing air to pass through, and the spines that provide shade while directing moisture droplets to the soil and shallow roots. Provide students with a “base,” such as a sponge or cucumber to serve as a cactus, and then ask them to design a model or demonstration that shows the role of both the waxy skin and the spines.

8. There are efforts underway to conserve cacti, as many species are at risk from habitat loss, invasive species, poaching and illegal trade, and a changing climate. The story describes the work the Minnesota Landscape Arboretum is doing to help conserve the Ball Cactus. Explore more about this work at their [website](#), or through the Center for Plant Conservation [website](#). They describe their work as having two goals: 1) preserving the “genetic library” of this cactus in Minnesota that grows on the edge of its range; and 2) bringing the Ball Cactus to the attention of Minnesota residents. Invite students to create art that helps Minnesotans know that our state has cacti species and then share that art in a way that helps viewers of the art learn more about these species.

9. Do you have a green thumb? Invite students to explore different careers associated with plants: What do we call people who work with plants? Where do they work? What do they do? Using the [Careers for Green Thumbs website](#) as a starting point, students can learn more about careers in agriculture and horticulture, such as nursery and greenhouse workers, horticulturists, florists, and flower specialists. Then invite students to reflect on if any of the jobs would be something they’d consider doing in the future.

WEB RESOURCES

MINNESOTA DNR WEB PAGES

[Plants of Minnesota](#)

[Geology in State Parks](#)

[Minnesota State Parks](#)

GENERAL TEACHER AND STUDENT RESOURCES

[Minnesota DNR Teachers’ Resources](#)

YOUNG NATURALISTS STORIES:

[Weird and Wonderful Plants](#)

[The Glacier Did It](#)

[Write, Sketch, Explore](#)

[Rich in Beauty](#)

MINNESOTA CONSERVATION VOLUNTEER STORIES

[Acres for All of Us](#)

OTHER MATERIALS

[Hooked On Horticulture: Elementary Curriculum, Minnesota Nursery & Landscape Association](#)

STUDY QUESTIONS ANSWER KEY

1. Where is Minnesota's "cactus country?"

a) in parts of western and southern Minnesota

b) along the north shore of Lake Superior

c) in the Northwestern corner of the state

d) in areas that have been disturbed by development

2. Name three ways cacti are adapted to living in warm and dry climates. **Suggested responses: shallow roots to absorb moisture from rain; spongy stems with a waxy coating to seal in moisture while allowing air to pass through; spines that are prickly and protect the plant from thirsty or hungry animals; spines that cast shade on the stem to reduce the sun's heat; spines that help direct moisture droplets to where the water can be absorbed by the roots.**

3. True or false: Because they live in such hot, dry, and harsh conditions, cacti do not make their own food through photosynthesis. **False. As long as a cactus has sunlight, air, and a bit of stored water, it can make its own food, even in harsh conditions.**

4. Which of the following factors has NOT shaped where cacti grow in Minnesota?

a. Glaciation followed by new soil formation

b. Climate (hot and dry in summer, then cold and dry in winter)

c. Rocky landscape that prevents other plants from taking over

d. Mineral deposits from ancient lava flows

5. True or false: Cacti in Minnesota only grow in protected areas on public lands, like in state parks or national wildlife refuges. **False. Protected lands do provide good habitat, such as the places mentioned in the story, but they are not limited to growing on protected lands and can grow elsewhere. Protected lands, though, seem particularly important to the Ball Cactus.**

6. Minnesota cacti do well in places where it is hot and dry in summer, then cold and dry in winter. Which of the following also does well in those conditions?

a. Forests

b. Prairies

c. Moss

d. Mushrooms

7. Which of the three species featured in the story likely inspired the title of the story, “On Pins and Needles?” **Suggested answer: Ball Cactus, pincushion cactus, as this species is named for its shape—like the round pads used to hold sewing pins.**

8. What are two reasons why rocky outcrops are good habitats for cacti? **Suggested answer: 1. The sunshine heats up the rocks, and the cacti can soak up this heat to reduce their risk of freezing; 2. In the event of a prairie fire, the fire won’t spread as easily over the rocks, providing some protection from the blaze.**

9. Of the three species of cacti in Minnesota, which is most common?

a) Plains prickly pear cactus

b) Ball cactus

c) Brittle prickly pear cactus

d) Barrel cactus

10. True or False: With proper care and good habitat, the ball cactus grows quite quickly. **False, Ball cactus grows quite slowly, taking several years to reach the size of a marble or blueberry.**

Challenge question: If cacti grow “in the wild,” why is the Minnesota Landscape Arboretum growing them in their greenhouse? **Answers may vary. Suggested answer: There is less habitat for Minnesota’s cacti because much of the prairie where cacti grow has been replaced by farms and towns. With far less natural habitat, two of Minnesota’s three cactus species—plains prickly pear and ball cactus—are becoming rare. The Arboretum is growing these two species from seed for replanting in natural habitats, which helps with their conservation.**

MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY

1. Compare and contrast the Plains prickly pear and the brittle prickly pear (one similarity and one difference). **Answers vary, but may include similarities such as yellow blossoms and segmented stems; differences such as the brittle prickly pear is more common and flowers less often than the Plains prickly pear, and the Plains prickly pear is more common.**

2. "On Pins and Needles" is an example of what type of writing?

- a. Fable
- b. Legend
- c. Historical Fiction
- d. Non-Fiction**

3. Based on the story details, what do you predict the author will most likely do now that she had an opportunity to visit the greenhouse at the Minnesota Landscape Arboretum?

- a. Plant cacti in her own garden
- b. Visit other state parks and wildlife refuges.
- c. Tell other people about what she learned about cacti.**
- d. Donate money to help endangered cacti.

4. From what point of view is "On Pins and Needles" written?

- A. First person**
- B. Third person
- C. Realistic fiction
- D. All of the above

5. What can we infer about the author from reading "On Pins and Needles?"

- A. She has studied a lot about geology and glaciers.
- B. She appreciates nature.**
- C. She has a green thumb.
- D. She works at a wildlife refuge.

VOCABULARY LIST

Succulent – a plant that can store water inside its body to survive in dry places

Seed bank – the storage of seeds for safe-keeping; a place where suitable conditions are maintained to conserve seed specimens of different plant species

Photosynthesis – the process where green plants convert sunlight into glucose, a sugary liquid that is the plant's source of food.

Segment – a part of a whole

Transplant – to move or transfer (something such as a plant) to another place

Refuge - a place that protects rare species or unique natural areas.

Blaze - a very large or fiercely burning fire

Spine - a sharp, pointed projection (such as the needle-like projections from a cactus stem)