

TEACHERS GUIDE

TO “JEWELS OF THE SKY”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, May-June 2022, 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 mndnr.gov/mcvmagazine and click on *past issues*.

Thank you for bringing Young Naturalists into your classroom!

“JEWELS OF THE SKY”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, May–June 2022, mndnr.gov/mcvmagazine.



SUMMARY. The ruby-throated hummingbird is not only Minnesota’s smallest bird, but also among its most remarkable. Take a wonder-filled journey with your students as you learn about this tiny creature’s diverse abilities, from using antimicrobial agents in its nest to flying backward.

SUGGESTED READING LEVELS. Third through middle school grades

MATERIALS. KWL organizer; optional resources include dictionaries, video viewing equipment, Internet access art supplies, large map of the Americas, 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. “Jewels of the Sky” 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 THE 2019 COMMISSIONER APPROVED DRAFT OF MN ACADEMIC STANDARDS IN SCIENCE)

SCIENCE AND ENGINEERING PRACTICES

1. Asking questions and defining problems

2. Developing and using models.
6. Constructing explanations (for science) and designing solutions (for engineering)
8. Obtaining, evaluating, and communicating information

CROSSCUTTING CONCEPTS

2. Cause and effect
6. Structure and function

DISCIPLINARY CORE IDEAS

Physical Sciences 1: Motion and stability

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

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

SOCIAL STUDIES

Citizenship and Government (Benchmarks: 3.1.1.1.1)

Geography (Standard 3.3.1.1, 4.3.1.1, 5.3.1.1; Benchmarks 3.3.1.1.1, 3.3.1.1.2, 4.3.1.1.1, 5.3.1.1.1)

ENGLISH LANGUAGE ARTS (GRADES 3-8)

Reading Benchmarks: Informational Text (Grades 3-8)

Key Ideas and Details (Benchmarks 3.2.1.1, 3.2.2.2, 4.2.1.1, 4.2.2.2, 5.2.1.1, 5.2.2.2, 6.5.2.2, 7.5.1.1, 8.5.1.1)

Craft and Structure (Benchmarks 3.2.4.4, 4.2.4.4., 5.2.4.4; 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)

WRITING BENCHMARKS (GRADES 3-8)

Research to Build and Present Knowledge (Benchmarks 3.6.7.7, 3.6.8.8, 4.6.7.7, 4.6.8.8, 4.6.9.9, 5.6.7.7, 5.6.8.8, 5.6.9.9, 6.7.7.7, 7.7.7.7, 8.7.7.7)

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

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 GRADES 3-8)

Vocabulary Acquisition and Use (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 (Grades 6-8)

Key Ideas and Details (Benchmarks 6.13.1.1, 6.13.2.2)

Integration of Knowledge and Ideas (6.13.8.8)

WRITING BENCHMARKS: LITERACY IN SCIENCE AND TECHNICAL SUBJECTS (GRADES 6-8)

Research to Build and Present Knowledge (Benchmark 6.14.7.7)

Arts (Grades 3-8)

Artistic Process: Create or Make (Benchmark 0.2.1.5.1, 0.3.1.5.1, 4.2.1.5.1, 6.2.1.5.1)

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. Ask your students if they have ever seen a hummingbird. What do they know about these tiny creatures? Give them a chance to share their thoughts and observations. Then divide them into small groups to do a [KWL activity](#). Within the groups, have students describe what they know (K) about hummingbirds 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 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.

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 red-winged blackbirds. 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 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. Hummingbirds unusual in that they can hover and even fly backward. What is it about their approach to flight that makes this possible? Use this hummingbird story as a launchpad for a lesson about bird flight and aeronautics more generally. Explore the “four forces” of flight—lift, weight, thrust, and drag—and how they affect a bird’s ability to become airborne and maneuver through three-dimensional space on your own or using a lesson plan such as the Cornell Lab of Ornithology’s [Animals in Flight](#). Invite older students to design innovative aircraft or build a model based on how nature balances these four forces in birds.

2. Ruby-throated hummingbirds use spider silk to hold their nests together and to the branch they’re attached to. And that’s not just because that’s what they are able to find lying around. Both strong and stretchy, spider silk is an amazing natural material. Go on an internet expedition to learn more about spider silk’s valuable characteristics. See how many ways you can find that humans have used spider silk, as well as ways it has inspired the development of other materials.

3. Locate on a map the countries in which ruby-throated hummingbirds winter. Then help each student find a pen pal in one of those countries (see [Virtual Pen Pals](#) for suggestions for connecting with classrooms around the world). If you begin this activity in the fall, students might be able to share with their pen pals around observations of the ruby-throated hummingbirds we share, as well as other hummingbirds native to those countries.

4. The story mentions how ornithologists learn about bird migration by putting tiny bands around birds’ legs and tracking where they are found. Invite a bird bander into your classroom to describe what they do and how it contributes to avian conservation. Alternatively, check with a nature center near you to learn if they offer opportunities to view bird banders in action.

5. Next spring, participate in Journey North. Share this [hummingbird page](#) with your students to learn more about the northward migration of hummingbirds in real time, share your observations, and monitor the observations of others around the U.S.

6. Read “The Flight of the Hummingbird” with your students (you can find “read aloud” versions on You Tube if your library does not have this picture book). This children’s book is from a South American Indigenous story about a courageous hummingbird that attempts to save the forest from a wildfire. The story’s illustrations by Haida artist Michael Nicoll Yahgulanaas provide an opportunity for students to explore the cultural

history of the hummingbird. Invite students to create their own illustrations that convey the theme of the story, to learn more about the artwork of this artist, or to learn more about the Quechan people of Peru and their relationship to the story and the hummingbird. Older students could be guided in learning about and reflecting on “[the story behind the story](#)” as well as the purposes in general for respectfully acknowledging the history of stories of Indigenous peoples. The story’s foreword by Nobel Peace Prize winner Wangari Maathai could be used as a jumping off point for discussions and projects that relate to the themes of kindness, compassion, helping, and responsibility.

7. Scientists and engineers often are inspired by nature to design, create, and invent things that advance our lives. For example, scientists have been studying hummingbirds’ muscles and bones to see if they can [engineer a drone](#) that mimics the agility and maneuverability of a hummingbird in flight. Scientists also have been studying the hummingbird’s use of torpor to [guide medical advances](#) relating to preventing heart and brain damage during surgery or slowing metabolism for space travel to Mars. Have students watch the National Geographic videos listed under the resources or other online videos that showcase the remarkable feats and features of the hummingbird. Encourage students to pick out a feat or feature of interest and brainstorm ways we could learn from it or apply it to solve a present-day need or problem.

8. The story explains that the hummingbirds’ colors do not come from pigment but are instead an example of structural color. Structural colors are responsible for many of the brilliant colors we see in nature, from the greens and blues of peacock feathers, the metallic colors of certain beetles, the shimmering colors of some fish, and even the blue of the sky. Engage students in learning about structural color by comparing acrylic paint and interference acrylic paint using [a lesson](#) from the National Informal STEM Education Network.

WEB RESOURCES

MINNESOTA DNR

GENERAL TEACHER AND STUDENT RESOURCES

[Minnesota DNR Teachers’ Resources](#)

[DNR Kids Page](#)

RELATED MCV ARTICLES

[Color by Nature \(Young Naturalists\)](#)

[How Do Birds Fly? \(Young Naturalists\)](#)

[The Nature of Feathers \(Young Naturalists\)](#)

[Minnesota Profile: Ruby-throated Hummingbird \(*Archilocus colubris*\)](#)

VIDEOS

[See Hummingbirds Fly, Shake, Drink in Amazing Slow Motion | National Geographic](#)

[Hummingbirds in Flight \(National Geographic\)](#)

[Super Hummingbirds \(PBS\)](#)

[Why do Hummingbirds Hover \(National Geographic\)](#)

STUDY QUESTIONS ANSWER KEY

1. According to the article, where might a ruby-throated hummingbird spend the winter? **Central America, Mexico, West Indies, southern U.S**

2. How does a male hummingbird try to attract a female?

a. **by flying back and forth in front of her.**

b. by giving her nectar from flowers.

c. by building a nest for her.

3. Name three things you might find in a hummingbird nest. **Answers may vary, but should include some of these: dandelion down, spider web, leaf bud scales, a female hummingbird, eggs, baby hummingbirds.**

4. Put the following activities in order, starting with the beginning of the calendar year.

Hummingbirds eat lots of food to prepare for migration

Hummingbirds start to fly north.

Hummingbirds arrive in Minnesota.

Hummingbirds mate.

The female builds a nest.

Baby hummingbirds hatch.

The young leave the nest.

The hummingbird drinks nectar from flowers.

Hummingbirds start to fly south.

5. Why do a male's red throat feathers sometimes look black? **Because the coloration doesn't come from pigment but from the way the structures that make up the feathers bend light. The angle at which you look at the feathers and the angle at which light hits them affect what color they appear.**

6. How does attracting hummingbirds help plants?

a. The hummingbird eats insects that might otherwise eat the plant.

b. **The hummingbird carries the plant's pollen to another plant so it can reproduce.**

c. The hummingbird's tongue secretes germ-killing substances that help keep the plant healthy.

d. It doesn't help them.

7. True or false: a hummingbird sucks nectar from a plant through its tongue like a person sucks a milkshake through a straw. **False. It collects it using bristles and draws it into its mouth.**

8. Name three animals that eat hummingbirds. **Answers may vary but may include sharp-shinned hawks, kestrels, orioles, kingbirds, cats, dragonflies, frogs.**

9. Match the amount of time with the activity;

Time it takes for a migrating hummingbird to reach its winter home – **two weeks**

Time it takes a hummingbird to fly across the Gulf of Mexico – **up to one day**

Time it takes a hummingbird to fly 45 miles – **one hour**

Time it takes for hummingbird eggs to hatch after they are laid – **two weeks**

10. What makes it possible for a hummingbird to fly backwards? **It flaps its wings in a figure eight.**

11. True or false: Like geese, hummingbirds fly south in V-shaped groups. **False. Hummingbirds migrate singly rather than in flocks or groups.**

Challenge Question: Why might native plants do a better job of attracting hummingbirds than nonnative plants would? **Answers may vary, but should focus on the notion that hummingbirds and native plants have existed together for a long time, so they have had a chance to evolve together (i.e., the plant has had time to evolve color, flower shape, and nectar characteristics that attract hummingbirds, while hummingbirds have had time to evolve physical traits such as the length and shape of their bills).**

MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY.

1. Ruby-throated hummingbird eggs are the size of

a. **a pencil eraser.**

b. the period at the end of this sentence.

c. a chicken egg.

d. a marble.

2. Based on what you learned in the article, why do you think a hummingbird might fly toward a person 3. How can you tell the difference between aspen bark and birch bark? **Birch bark peels off in thin strips, showing a salmon-colored layer underneath.**

3. During what season(s) of the year does a hummingbird sip nectar from flowers? **Spring, summer, fall, winter.**

4. How does a hummingbird make a humming sound?

- a. by moving its long tongue in and out of its bill
- b. by vibrating a membrane in the back of its throat
- c. by rapidly wiggling its tail
- d. **by rapidly flapping its wings**

5. Put these in order: increased body weight - decreased daylight hours – changes in hormone levels – increased feeding

In the fall, decreased daylight causes **changes in hormone levels**, which leads to **increased feeding**, which leads to **increased body weight**.

VOCABULARY LIST

Extract – remove from

Navigate – find one's way around

Nectar – sweet liquid

Prowess – ability

Regurgitating – vomiting

Territory – area an animal lives in

Pendulum – a hanging weight that swings from side to side

Hormones -chemicals that carry messages from one part of the body to another

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