

Teachers Guide

Prepared by **“Night Fliers” Multidisciplinary Classroom Activities**

Jack Judkins, Teachers guide for the Young Naturalists article “Night Fliers” by Christine Petersen.

Curriculum Published in the May–June 2013 *Minnesota Conservation Volunteer*, or visit

Connections www.mndnr.gov/young_naturalists/bats

Minnesota

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.

***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

“Night Fliers” introduces young readers to seven species of bats native to Minnesota. A bat’s body is designed for flight. The author explains how bats evolved body structures that enable flight. Other topics include bat habitats, diet, reproduction, and environmental threats. Photos with helpful captions accompany the text. A short quiz contrasting bats and birds is included.

Suggested reading levels:

Third through middle school grades

Total words:

1,820

Materials:

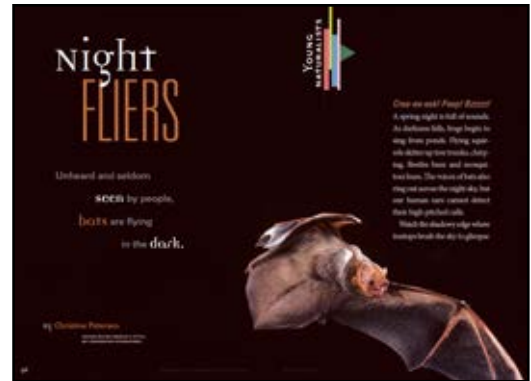
“Living with Bats” DNR fact sheet (see Web resources below), *Stokes Beginner’s Guide to Bats* (See References), paper, poster board, colored pencils, crayons, pens, markers, print and online resources your media specialist may provide

Preparation time:

One to two hours, not including time for extension activities

Estimated instructional time:

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



“Night Fliers”—Teachers Guide

Minnesota Academic Standards applications:

“Night Fliers” 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

Grade 6

Number and Operation

6.1.1.3; 6.1.1.4; 6.1.2.2; 6.1.3.3

Science

Grades 3, 5 and 7

Life Science

3.4.1.1.1; 3.4.3.2.1; 5.4.1.1.1;

5.4.4.1.1; 7.4.2.1.2; 7.4.3.2.1;

7.4.3.2.2; 7.4.3.2.4; 7.4.4.1.2

The Nature and Science of Engineering

4.1.2.1.1

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*.

Preview

Display bat myths (www.incrediblebats.com/batinfo.html). Ask students to choose fact or myth. Follow with class discussion of bats’ bad reputation. Why are bats feared or even hated by so many people? Preview the photos in the article. Ask students to predict what they will learn from the article. Another preview strategy is **KWL** (Ogle, 1986). To find out

“Night Fliers”—Teachers Guide

Preview continued

what your students already know (**K**) about bats, ask small groups to brainstorm their ideas. Then combine the groups’ data to make a class list. Repeat step one by asking what students would like to learn (**W**). As you read and discuss the article you will begin to compile the (**L**) list, or what they learn while reading the article and related materials and participating in extension activities. Display your **K** and **W** ideas on poster board or paper. See www.technology.com/web_tools/graphic_org/kwl for a KWL generator that will produce individual organizers for your students. KWL gives you the opportunity to introduce interdisciplinary connections you will make during extension activities. If you use the article in math or art class, you may wish to focus your prereading discussion on academic standards that apply for that class. 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). Words italicized in the article 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 line, 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 bats 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) Students may write essays describing the environmental challenges faced by bats, with possible solutions. (4) Poster presentations may supplement or take the place of essays. Students may work in small groups with each group focusing on a different species or other main idea from the article. (5) Ask students to choose a bat myth and to provide facts that debunk the myth.

“Night Fliers”—Teachers Guide

Extension activities

1. “Laying Bat Myths to Rest” is an excellent companion piece for “Night Fliers.” See Related Articles for link.
2. Build one or more bat houses. A variety of plans are available. See Web Resources, *Woodworking for Wildlife*, and Stokes Beginner’s Guide to Bats.
3. Explore challenges that wind turbines pose for bats and other flying creatures. Are the benefits of wind energy worth the harm done to bats and birds? Assign groups to argue for and against wind energy.
4. Learn more about white-nose syndrome. See “A Coming Crisis for Our Bats” in Related Articles. Challenge students to propose a plan to reduce the risk this disease poses for bats.
5. The terms lift and thrust are used to explain how bats fly. Play the robot bat video (www.popsci.com/science/article/2013-02/flapping-robotic-bat-wing-helps-biologists-uncover-secrets-bat-flight) and then ask students to sketch a bat in flight with arrows to show *lift* and *thrust*.
6. How bats evolved is one of the most interesting mysteries of evolutionary biology. Challenge students to read one or more of the articles in Web Resources and to make a written or oral report. Bat evolution would make an excellent poster project.

Web resources

DNR Bat Information

www.dnr.state.mn.us/mammals/bats.html

www.dnr.state.mn.us/livingwith_wildlife/bats/index.html

University of Minnesota Bat Information

www.extension.umn.edu/distribution/horticulture/M1281.html

www.nrri.umn.edu/bats/learn/facts.asp

Bat Myths

www.nwf.org/Kids/Ranger-Rick/Animals/Mammals/Bat-Myths.aspx

Bat Conservation

www.batcon.org

www.batconservation.org

www.batcon.org/index.php/get-involved/install-a-bat-house.html

www.eparks.org/wildlife_protection/wildlife_facts/bats/bat_house.asp

www.learner.org/jnorth/tm/spring/BatHouse.html

www.batcon.org/pdfs/bathouses/SingleChamberBHPlans.pdf

www.npwrc.usgs.gov/resource/wildlife/ndblinds/johnbat.htm

How Bats Fly

www.zoo.cam.ac.uk/zoostaff/ellington/aerodynamics.html

Vampire Bats

animals.nationalgeographic.com/animals/mammals/common-vampire-bat

kids.nationalgeographic.com/kids/animals/creaturefeature/vampire-bat

www.youtube.com/watch?v=9Va9ull44yw

animal.discovery.com/tv-shows/other/videos/raw-nature-vampire-bats.htm

Flying Foxes

animals.nationalgeographic.com/animals/mammals/little-red-flying-fox

www.dse.vic.gov.au/plants-and-animals/flying-foxes-home-page/flying-foxes-about-flying-foxes

“Night Fliers”—Teachers Guide

Web resources continued

Bat Evolution

www.thewildclassroom.com/bats/evolution.html
skywalker.cochise.edu/wellerr/students/bats/project.htm
www.guardian.co.uk/science/2008/feb/13/bat.evolution
news.nationalgeographic.com/news/2005/01/0127_050127_bats.html
www.nhc.ed.ac.uk/index.php?page=493.169.177

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 DNR Teacher Resources

www.mndnr.gov/education/teachers
www.mndnr.gov/dnrkids

*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 at webapps8.dnr.state.mn.us/volunteer_index

July–August 1991

“Laying Bat Myths to Rest” (Use as companion article)

https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=827

January–February 1997

“The Name Game” (YN article)

www.dnr.state.mn.us/young_naturalists/namegame

July–August 2002

“Bat Mine” (Bat habitat and survey)

www.dnr.state.mn.us/volunteer/julaug02/batmine.html

September–October 2003

“Big Brown Bat (*Eptesicus fuscus*)”

www.dnr.state.mn.us/volunteer/sepoct03/profile.html

July–August 2005

“Adventure Underground” (Bat habitat)

www.dnr.state.mn.us/volunteer/julaug05/underground.html

July–August 2011

“A Coming Crisis for Our Bats”

www.dnr.state.mn.us/volunteer/julaug11/white_nose.html

References

Henderson, C.L. *Woodworking for Wildlife* (Ed. 3). St. Paul, Minn.: Minnesota Department of Natural Resources, 2010.

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

Ogle, D.S. K-W-L Group Instructional Strategy. In A.S. Palincsar, D.S. Ogle, B.F. Jones, and E.G. Carr (Eds.), *Teaching Reading as Thinking: Teleconference Resource Guide*, pp.11–17. Alexandria, Va.: Association for Supervision and Curriculum Development, 1986.

Williams, K., Mies, R., Stokes, D., and Stokes, L. *Stokes Beginner’s Guide to Bats*. New York: Little Brown and Company, 2002.

“Night Fliers”—Teachers Guide

Study Questions

Teachers guide for the Young Naturalists article “Night Fliers” by Christine Petersen. Published in the March–April 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/bats

Name _____ Period _____ Date _____

1. Why can't humans hear bat calls? _____

2. Bats are active at night, which means they are _____ .

3. Minnesota's seven bat species are about what percentage of all the species of bats on Earth? _____

4. Bats especially have to watch out for what predator? Why? _____

5. How do we know bats are mammals? _____

6. Compare and contrast bats and flying squirrels. _____

7. Bones in a bat's wings are related to what body parts in people? _____

8. Around the world bats eat _____

Minnesota's bats eat only _____.

9. Explain how bats use sound to survive. _____

10. What percentage of its body weight does a bat typically eat in one night? _____

11. Little brown, big brown, and hoary bats prey on _____,
_____, and _____.

12. If hoary bats weigh 28.35 grams, how much do tri-colored bats weight? _____

13. Which species of Minnesota bats migrate to warmer places, and which species hibernate through the winter?

14. During hibernation the little brown bat's heart rate is _____.

What percentage of its heart rate while flying is its hibernating heart rate? _____

15. Bats evolved _____ million years ago.

16. Describe two challenges bats face to their survival. _____

Challenge: What makes bats unique? Hint: they have two characteristics that enable them to prey on nocturnal insects. _____

Study Questions Answer Key

Teachers guide for the Young Naturalists article “Night Fliers” by Christine Petersen. Published in the May–June 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/bats

1. Why can't humans hear bat calls? **Bats' calls are at higher frequencies than human hearing can detect. For example, dogs can hear dog whistles, but people cannot.**
 2. Bats are active at night, which means they are **nocturnal**.
 - *3. Minnesota's seven bat species are about what percentage of all the species of bats on Earth? **There are about 1,200 known species of bats in the world. Minnesota's seven native species are only 0.5 percent of the total species. ($7 \div 1200 = 0.005$ or 0.5%)**
 4. Bats especially have to watch out for what predator? Why? **Bats have to watch out for owls because owls also hunt at night.**
 5. How do we know bats are mammals? **Mammals are furry (have hair), are warm-blooded, and feed their young with milk produced by the mother.**
 - *6. Compare and contrast bats and flying squirrels. **Bats and flying squirrels are both mammals, have skin membranes that stretch out from their bodies between their front and back limbs, and are nocturnal. Bats can truly fly, while flying squirrels can only glide.**
 - *7. Bones in a bat's wings are related to what body parts in people? **A bat's wing has finger and thumb bones.**
 8. Around the world bats eat **fruit, nectar, frogs, mice, fish, blood, and insects**. Minnesota's bats eat only **insects**.
 - *9. Explain how bats use sound to survive. **In echolocation, bats produce high-pitched sounds that bounce off objects such as trees, other predators, and insects, and reflect back to the bat's ears. The bat uses sound to locate the object and to either avoid harm or catch a meal.**
 - *10. What percentage of its body weight does a bat typically eat in one night? **50 percent (half = 50%)**
 11. Little brown, big brown, and hoary bats prey on **mosquitoes, beetles, and moths**.
 - *12. If hoary bats weigh 28.35 grams, how much do tri-colored bats weigh? **Tri-colored bats weigh 5.67 grams ($28.35 \div 5 = 5.67$)**
 13. Which species of Minnesota bats migrate to warmer places, and which species hibernate through the winter? **Hoary bats, eastern red bats, and silver-haired bats migrate, while little and big brown bats, and tri-colored and northern myotis bats hibernate.**
 - *14. During hibernation the little brown bat's heart rate is **25 beats per minute**.
What percentage of its heart rate while flying is its hibernating heart rate? **During flight its heart beats 1,365 times per minute. Its hibernation heart rate is 1.8% of its heart rate in flight ($25 \div 1,365 = 0.018$ or 1.8%).**
 15. Bats evolved **52 million years ago**.
 16. Describe two challenges bats face to their survival. **Wind turbines and white-nose syndrome are two threats to bats' survival. Wind turbines are huge blades that turn in the wind. Bats fly into the blades and are injured or killed. White-nose disease is a fungus that grows on bats' noses, ears, and wings and interferes with hibernation.**
- Challenge:* What makes bats unique? Hint: they have two characteristics that enable them to prey on nocturnal insects. **Responses will vary. Bats are the only mammals that have developed the ability to fly. They use flight and echolocation to hunt for insects at night when many predators are resting.**

“Night Fliers”—Teachers Guide

Minnesota Comprehensive Assessments Practice Items

Teachers guide for the Young Naturalists article “Night Fliers” by Christine Petersen. Published in the May–June 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/bats

Name _____ Period _____ Date _____

1. Forestville/Mystery caves are winter homes to

- A. hoary bats.
- B. little brown bats.
- C. eastern red bats.
- D. silver-haired bats.

2. Which species of Minnesota bats are most likely to have two pups?

- A. little brown bats
- B. big brown bats
- C. eastern red bats
- D. B and C

3. Bats are acrobatic flyers because their wings are

- A. short
- B. flexible
- C. long
- D. rigid

4. Describe how bats use their thumbs. _____

5. Army worm populations are controlled by

- A. little brown bats
- B. northern myotis
- C. hoary bats
- D. big brown bats

“Night Fliers”—Teachers Guide

Minnesota Comprehensive Assessments Answer Key

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1. Forestville/Mystery caves are winter homes to **B. little brown bats**.
2. Which species of Minnesota bats are most likely to have two pups? **D. B and C**
3. Bats are acrobatic flyers because their wings are **B. flexible**
4. Describe how bats use their thumbs. **Bats use their thumbs to grab, climb, and hang.**
5. Army worm populations are controlled by **C. hoary bats**

“Night Fliers”—Teachers Guide

Vocabulary

Teachers guide for the Young Naturalists article “Night Fliers” by Christine Petersen. Published in the May–June 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/bats

biologist	scientist who studies all forms of life
camouflage	protective coloration in animals that allows them to blend into the background
evolve	develop from an earlier biological form
fungus	spore-producing organism that absorbs nutrients from its host organism
habitat	home environment of a plant or animal
larvae (pl)	immature, wingless, worm-shaped forms of many insects
mammal	warm-blooded, vertebrate animal with hair that feeds its young milk secreted by the female
mammalogist	scientist within the field of zoology who studies mammals
membrane	thin layer of tissue
nocturnal	active at night
predator	animal that kills and eats other animals
species	group of organisms that resemble each other and may reproduce

“Night Fliers”—Teachers Guide

Vocabulary Study Cards

Teachers guide for the Young Naturalists article “Night Fliers” by Christine Petersen. Published in the May–June 2013 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/bats

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 a
biologist?

FOLD HERE

**A scientist who studies
all forms of life is a**

An animal uses
camouflage as

FOLD HERE

**Protective coloration that
allows the animal to blend
into the background is**

To **evolve** is to

FOLD HERE

**To develop from an earlier
biological form is to**

A **fungus** is

FOLD HERE

**A spore-producing organism
that absorbs nutrients from
its host organism is a**

“Night Fliers”—Teachers Guide

What is a **habitat**?

FOLD HERE

The **home environment of a plant or animal** is called its

Larvae are

FOLD HERE

The **immature, wingless, worm-shaped forms of many insects** are called

What is a **mammal**?

FOLD HERE

A **warm-blooded vertebrate animal with hair that feeds its young milk secreted by the female** is a

What do **mammalogists** study?

FOLD HERE

Scientists within the field of **zoology** who study **mammals** are

What is a **membrane**?

FOLD HERE

A **thin layer of tissue** is a

“Night Fliers”—Teachers Guide

To be **nocturnal** is to be

FOLD HERE

To be **active at night** is to be

A **predator** is an

FOLD HERE

An **animal that kills and eats other animals** is a

What is a **species**?

FOLD HERE

A **group of organisms that resemble each other and may reproduce** is a

FOLD HERE

FOLD HERE