Young Naturalists

Teachers Guide

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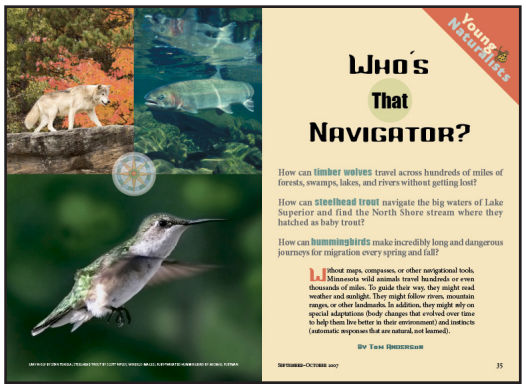
"Who's That Navigator" Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article "Who's That Navigator" by Tom Anderson. Published in the September–October 2007 *Minnesota Conservation Volunteer*, or visit www.dnr.state.mn.us/young_naturalists/wild_navigation.



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 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 a to suit user needs. Users are encouraged to provide feedback through an online survey at www.dnr.state.mn.us/education/teachers/activities/ynstudyguides/survey.html. Please note if you are downloading* Conservation Volunteer *articles from the Web site that only Young Naturalists articles are available in PDF.*

Summary

"Who's That Navigator?" helps young readers understand how it is that some birds, fish, and mammals are able to navigate over great distances. The text explains current scientific theories of how animals are able to navigate, and is supplemented by excellent photos and illustrations that trace migration patterns of hummingbirds, bobolinks, and steelhead trout, and territorial routes of wolves. The article concludes with tips for finding a north compass bearing if you have no compass.

Suggested reading levels: upper elementary through middle grades

Total words: 1,143

Materials: Paper, poster board, pencils, pens, markers, and print resources from your media center as well as Web sites, blank map of North and South America (western hemisphere)

Preparation time: One to two hours, not including time for extension activities

Estimated instructional time: Two to three 50-minute class periods (not including extensions)

Minnesota Academic Standards applications: "Who's That Navigator?" may be applied to the following Minnesota Department of Education Academic Standards:

Language Arts

I. Reading and Literature
- A. Word Recognition, Analysis and Fluency
- B. Vocabulary Expansion
- C. Comprehension

II. Writing
- A. Types of Writing
- B. Elements of Composition
- C. Spelling
- D. Research
- E. Handwriting and Word Processing

III. Speaking, Listening and Viewing
- A. Speaking and Listening
- B. Media Literacy

Minnesota History and Social Studies

V. Geography

Grades 4–8
- B. Map Use: The student will make and use maps to acquire, process, and report on the spatial organization of people and places on Earth.
- D. Interconnections: The student will describe how humans influence the environment and in turn are influenced by it.
- E. Essential Skills: The student will use maps, globes, geographic information systems, and other sources of information to analyze the natures of places at a variety of scales.

Science

Grade 3

IV. Life Science
- B. Diversity of Organisms
- C. Interdependence of Life

Grade 4

IV. Life Science
- B. Diversity of Organisms

Grade 5

IV. Life Science
- F. Flow of Matter and Energy

Grade 7

IV. Life Science
- B. Diversity of Organisms
- C. Interdependence of Life
- F. Flow of Matter and Energy

Arts

Artistic Expression: Visual Arts

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

Before you read, ask students to survey the article. Examine the photos. Use the **KWL** strategy (Ogle, 1986) to find out what your students already know (**K**) about animal navigation, what (**W**) they would like to learn, and eventually, what they learned (**L**) while reading the article and related materials, and through participating in extension activities. Display your **K** and **W** ideas on poster board or paper (see Vocabulary preview). Add to your **L** list as you read and discuss the article. See www.teachnology.com/web_tools/graphic_org/kwl for a **KWL** generator that will produce individual organizers for your students. **KWL** also gives you the opportunity to introduce interdisciplinary connections you will make during extension activities. For example, if you plan to use the article during social studies, science, or art, you may ask students to review their **KWL** for concepts that are specific to those disciplines.

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. 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).

Connections to vocabulary in the article may also be made during KWL. If students are not familiar with some of the terms, include them in the W list. Other terms may be added to the W list as they read the article. Eventually they can be moved to the L list. You may write vocabulary from the article in green ink, while other ideas are written in black. Note: Some of the words in the vocabulary list definitions may require further explanation. Also, preview the study questions for unfamiliar terms, such as hazards and categorize.

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 that 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 5, 6, 8, 9 through 13, 15 and the Challenge require varying degrees of analytical thinking.

Adaptations

Read aloud to special needs students. Abbreviate the study questions or highlight priority items to be completed first, for example, items 1–5, 7, 8, 14, and 15. 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 write an essay describing the migration of one or more of the species in the article. (2) Students may write an essay comparing and contrasting the migrations of two different species. (3) Students may, on a map of North and South America, illustrate the migratory route of one or more of the species in the article. (4) Poster presentations may describe how birds are endangered by natural and man-made hazards on their journeys to Minnesota from Central and South America.

Extension activities

1. Investigate how two interrelated environmental issues, diminishing rainforests and global climate change, are affecting migratory birds. See Web sites below.
2. Invite a DNR Nongame naturalist (www.dnr.state.mn.us/eco/nongame/central.html) to your classroom or visit one of Minnesota's 72 state parks (www.dnr.state.mn.us/state_parks/list.html) for presentations on migratory animals.
3. Students who have bird feeders at home can monitor traffic to identify migratory species. Keep a chart of how many different species are spotted each day.
4. See www.rainforest-alliance.org/programs/education/teachers/curriculum/ for many excellent project ideas.
5. Use split-image art to illustrate a species in its summer and winter habitats. Accompanying text can describe changes in diet, weather, vegetation, predators, and other environmental characteristics.
6. Introduce your students to orienteering. Check your library for resources, or see www.mnoc.org/teachkit.shtml.

Web resources

Bird migration

www.backyardnature.net/birdmgrt.htm
www.nature.org/initiatives/programs/birds/about
www.hummingbirdworld.com/h

Fish migration
www.dnr.state.wi.us/org/caer/ce/eek/critter/fish/rainbowTrout.htm

Wolf migration
www.wolf.org/wolves/experience/telemsearch/vtelem/telem_intro.asp

Migration maps
www.hummingbirds.net/map.html
www7.nationalgeographic.com/ngm/0701/feature4/map.html

Environmental Connections
www.rainforest-alliance.org/programs/education/teachers/curriculum
www.rainforest-alliance.org/programs/education/teachers

Teacher resources
www.dnr.state.mn.us/education/teachers

Many related *Minnesota Conservation Volunteer* articles are available online at www.dnr.state.mn.us/volunteer/articles including:

May–June 2003
"Smallies on the Move"
www.dnr.state.mn.us/volunteer/julaug03/smbass.html

September–October 2004
"Flights of Fall"
www.dnr.state.mn.us/volunteer/septoct04/flights.html

July–August 2007
"Hoot, Tremolo, Yodel, and Wail"
www.dnr.state.mn.us/young_naturalists/loons

References

1. Hock, M.F., Deshler, D.D., and Schumaker, J.B. *Strategic Tutoring.* Lawrence, Kan.: Edge Enterprises, 2000.
2. 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.

Study Questions

"Who's That Navigator?" by Tom Anderson.
Minnesota Conservation Volunteer, September–October 2007
www.dnr.state.mn.us/young_naturalists/wild_navigation

Name _____ Period _____ Date _____

1. What do timber wolves, steelhead trout, and hummingbirds have in common? _____

_____

_____

2. Without compasses, how do migrating animals navigate? _____

_____

3. How are bobolinks, Baltimore orioles, and ruby-throated hummingbirds alike? _____

_____

4. Why do hummingbirds migrate? _____

_____

5. What is the most difficult part of a hummingbird's journey? Why? _____

_____

_____

6. Categorize the hazards migrating birds face into natural and man-made. Add some that are not in the story.

Natural	**Man-made**
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____
7. _____	7. _____
8. _____	8. _____

7. What do ornithologists know or believe about how birds navigate? _____

_____

8. Help the steelhead trout complete its migration by arranging this list in the correct order. Write a number from 1 to 5 in the blank next to each event.

Live and grow in stream. _____

Live and grow in Lake Superior for three years. _____

Smolts migrate into Lake Superior and disperse. _____

Return to home stream to spawn. _____

Hatch upstream from Lake Superior. _____

The next five items are True or False. Circle the best answer.

9. Some fish use the position of the sun to find their home stream. True False

10. Fish in the perch family have tiny particles of iron in their brains. True False

11. Steelhead remember the sounds of their home stream. True False

12. The gray wolf is the largest wild dog in Minnesota. True False

13. Wolves migrate long distances. True False

14. After a hunt, how do wolves find their way home? _____

_____

_____

15. What senses do wolves use to communicate with other wolves both within and outside of their pack? _____

_____

_____

_____

_____

16. Of the five tips for finding north, pick the one you believe would work best for you and explain why. _____

_____

_____

Challenges: Using a map of Central and North America, find at least five cities where you might see a hummingbird on its trip from Panama to Bemidji. _____

_____

_____

_____

Study Questions Answer Key

"Who's That Navigator?" by Tom Anderson.
Minnesota Conservation Volunteer, September–October 2007
www.dnr.state.mn.us/young_naturalists/wild_navigation

1. What do timber wolves, steelhead trout, and hummingbirds have in common? **They all make long journeys without maps or compasses.**
2. Without compasses, how do migrating animals navigate? Answers may include weather and sunlight cues, geographic landmarks, special physical characteristics or instincts.
3. How are bobolinks, Baltimore orioles, and ruby-throated hummingbirds alike? They are all birds that spend winter in the tropics and migrate to North America in the spring.
4. Why do hummingbirds migrate? They feed on flower nectar, so they follow blooming flowers.
5. What is the most difficult part of a hummingbird's journey? Why? Crossing the Gulf of Mexico. It is a 20-hour non-stop flight.
6. Categorize the hazards migrating birds face into natural and man-made. Add some that are not in the story.

Natural	**Man-made**
1. Strong winds	**1. House cats**
2. Heavy rains	**2. Tall buildings**
3. Thunder	**3. Wires from radio and TV towers**
4. Lighting	**4. _____**
5. Snowstorms	**5. _____**
6. Predators	**6. _____**
7. _____	**7. _____**
8. _____	**8. _____**

Answers may vary for additions to the lists. Possibilities include starvation, wind generators, windows, disease.

7. What do ornithologists know or believe about how birds navigate? Birds may use geographic features, the position of the sun, stars, or planets, the Earth's magnetic field, or perhaps by an internal chemically sensitive compass.
8. Help the steelhead trout complete its migration by arranging this list in the correct order by writing a number from 1 to 5 in the blank next to each event.

Live and grow in stream. **2**
Live and grow in Lake Superior for three years. **4**
Smolts migrate into Lake Superior and disperse. **3**
Return to home stream to spawn. **5**
Hatch upstream from Lake Superior. **1**

The next five items are True or False. Circle the best answer.

9. Some fish use the position of the sun to find their home stream. **True**
10. Fish in the perch family have tiny particles of iron in their brains. **False**
11. Steelhead remember the sounds of their home stream. **False**
12. The gray wolf is the largest wild dog in Minnesota. **True**
13. Wolves migrate long distances. **False**

    Bonus: Find the correct answers for items 10, 11 and 13. (10) Salmon and steelhead trout, not perch. (11) Steelhead remember the smell of their home stream. (13) Wolves do not migrate, but hunt across large home ranges.

14. After a hunt, how do wolves find their way home? **Wolves appear to use instinct to navigate.**
15. What senses do wolves use to communicate with other wolves both within and outside of their pack? **They use their sense of smell and hearing. They mark the boundaries of their territory with urine (scent), which tells other wolves to stay out. They howl to communicate with members of their pack.**
16. Of the five tips for finding north, pick the one you believe would work best for you and explain why. **Answers will vary.**

Challenge: Using a map of Central and North America, find at least five cities where you might see a hummingbird on its trip from Panama to Bemidji. **Students can select major cities in Costa Rica, Nicaragua, Honduras, Guatemala, Mexico, Texas, Oklahoma, Missouri, Iowa, and Minnesota.**

Minnesota Comprehensive Assessments Practice Items

"Who's That Navigator?" by Tom Anderson.
Minnesota Conservation Volunteer, September–October 2007
www.dnr.state.mn.us/young_naturalists/wild_navigation

Name _____Period _____Date_____

1. Why do thatch-building ants usually work on the south side of their mound?
   A. They find more food there.
   B. The sun warms the south side.
   C. Their predators often attack the south side.
   D. All of the above.

2. Wolves navigate by _____.
   A. the sun
   B. Earth's gravitational field
   C. instinct
   D. the stars

3. Steelhead trout locate the stream in which they hatched by using their sense of _____.
   A. hearing
   B. touch
   C. sight
   D. smell

4. Birds that migrate at night may use _____ to navigate.
   A. the position of stars and planets
   B. Earth's magnetic field
   C. A and B
   D. none of the above

5. _____ begin their spring migration in Argentina.
   A. Hummingbirds
   B. Wolves
   C. Steelhead trout
   D. Bobolinks

Minnesota Comprehensive Assessments Practice Items Answer Key

"Who's That Navigator?" by Tom Anderson.
Minnesota Conservation Volunteer, September–October 2007
www.dnr.state.mn.us/young_naturalists/wild_navigation

1. Why do hatch-building ants usually work on the south side of their mound? **B. The sun warms the south side.**
2. Wolves navigate by **C. instinct.**
3. Steelhead trout locate the stream in which they hatched by using their sense of **D. smell.**
4. Birds that migrate at night may use **C. A the position of stars and planets and B. Earth's magnetic field** to navigate.
5. **D. Bobolinks** begin their spring migration in Argentina.

Vocabulary

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disperse	scatter or go in different directions
homing mechanism	method for finding a way home after a long journey
microscopic	extremely small
migration	move from one region of a country or the world to another
navigate	follow the correct route
nectar	sweet liquid that flowering plants produce to attract insects and birds
neotropical	area including Mexico, Central America, South America, and the West Indies
ornithologist	person who studies birds
predator	organism that kills and eats other organisms
spawn	produce eggs
theorize	to guess about how something works
tributary stream	a stream that flows into a larger river or lake

Vocabulary Study Cards

"Who's That Navigator?" by Tom Anderson.
Minnesota Conservation Volunteer, September–October 2007
www.dnr.state.mn.us/young_naturalists/wild_navigation

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.

To **disperse** means to	To **scatter** means to
A **homing mechanism** is a	A **method for finding a way home after a long journey** is a
A **microscopic** object is	An **extremely small** object is

A
migration
is a

A
move from one region to another
is a

To
navigate
is to

To
follow the correct route
is to

The
neotropical
areas include

Mexico, Central America, South America, and the West Indies
are

An
ornithologist
studies

A person who studies
birds
is an

What is
a predator?

What is
An animal that kills and eat other animals
called?

To
spawn
is to

When fish
produce eggs
they

To
theorize
is to

To make a
guess about how something works
is to

A
tributary stream

A stream that
flows into a larger river or lake
is called a