

Teachers Guide

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“Counting Critters” Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article “Counting Critters” by Bob and Jan Welsh. Published in the January–February 2008 *Minnesota Conservation Volunteer*, or visit www.dnr.state.mn.us/young_naturalists/counting_critters/index.html.

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 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 that if you are downloading articles from the web site only the Young Naturalists article is available in PDF.



Summary

“Counting Critters” describes how wildlife managers monitor population levels of a variety of species in Minnesota. The authors explain why it is important to count wildlife; when, where, and how animals are counted; who does the counting; and how the data are used. Among the animals discussed are moose, loons, deer, bald eagles, wolves, heron, ring-necked pheasants, frogs, toads, bears, and ruffed grouse. This article may be used to supplement your mathematics curriculum (See Extension activities).

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Suggested reading levels: mid-elementary through eighth grade
Total words: 2,011

Materials: Paper, poster board, pencils, pens, markers, and print resources from the DNR Web site (See Web Resources)

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: “Counting Critters” may be applied to the following Minnesota Department of Education 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

Mathematics

Grades 3–8

Data Analysis

3.4.1.1: Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels

and units.

4.4.1.1: Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.

5.4.1.1: Know and use the definitions of the mean, median and range of a set of data. Know how to use a spreadsheet to find the mean, median and range of a data set. Understand that the mean is a “leveling out” of data.

5.4.1.2: Display and interpret data; determine mean, median and range.

7.4.1.1: Determine mean, median and range for quantitative data and from data represented in a display. Use these quantities to draw

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conclusions about the data, compare different data sets, and make predictions.

- 7.4.2.1: Use reasoning with proportions to display and interpret data in circle graphs (pie charts) and histograms. Choose the appropriate data display and know how to relate the display using a spreadsheet or other graphing technology.
- 8.4.1.2: Use a line of best fit to make statements about approximate rate of change and to make predictions about values not in the original data set.

Number and Operation

- 4.1.3.7: Read and write tenths and hundredths in decimal and fraction notations using words and symbols; know the fraction and decimal equivalents for halves and fourths.
- 5.1.2.2: Find 0.1 more than a number and 0.1 less than a number. Find 0.01 more than a number and 0.01 less than a number. Find 0.001 more than a number and 0.001 less than a number.
- 5.1.2.5: Round numbers to the nearest 0.1, 0.01 and 0.001.
- 6.1.1.3: Understand that percent represents parts out of 100 and ratios to 100.

Science

Grade 4

IV. Life Science

B. Diversity of Organisms

Grade 5

IV. Life Science

Flow of Matter and Energy

Grades 7

IV. Life Science

B. Diversity of Organisms

C. Interdependence of Life

F. Flow of Matter and Energy

Social Studies

V. Geography

Grades 4–8

B. Maps and Globes: 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.

Arts

Artistic Expression

D. 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 the Conservation Volunteer.

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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 wildlife management, 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. You might begin by asking small groups to brainstorm K and W lists. Then combine the groups’ lists to make a class list. 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.teach-nology.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 math, you may ask students to review their KWL for concepts that are specific to those disciplines.

If you have access to a projector or document camera, show the graphs on page 14 of the Farmland Wildlife Populations report at files.dnr.state.mn.us/publications/wildlife/populationstatus2007/ch1_07.pdf. Ask students to analyze the trends for white-tailed deer and mourning doves. You should be able to get a good discussion going about the importance of wildlife monitoring.

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). Italicized terms have not been included on the list.

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. Notes: Some of the words in the vocabulary list definitions may require further explanation.

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

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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 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.

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 7, 12, 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, 2, 3, 4, 5, 14, and 17. 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 importance of wildlife management. (2) Make a T-chart with Species in the right column and Counting Tactics in the left column. (3) Poster presentations may illustrate/describe how a particular species is monitored.

Extension activities

1. Students may, on a map of Minnesota, illustrate the population density of one or more of the species in the article. See Status of Wildlife Populations, Fall 2007 (files.dnr.state.mn.us/publications/wildlife/)

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- populationstatus2007/toc.pdf) for information on populations, and www.50states.com/maps/minnesota.htm for a Minnesota blank map.
2. Students may write an essay comparing and contrasting the populations of two species, one declining and one growing.
 3. Invite a DNR wildlife manager (files.dnr.state.mn.us/contact/wildlife_managers.pdf) to your classroom to expand your discussion of wildlife management or to let you know how you and your students can get involved in population monitoring.
 4. Explore possibilities for getting involved in monitoring frogs and toads, butterflies, or bluebirds.
 5. Analyze data from Status of Wildlife Populations, Fall 2007 or ask students to construct their own graphs from tables in the reports.
 6. See www.dnr.state.mn.us/education/teachers/activities/wolves.html for information about the Wolves in Your Backyard project for students in grades 5–12.
 7. Encourage your students to investigate the differences and similarities of wildlife managers, conservation officers, and wildlife biologists. Perhaps your nearest DNR office can arrange a panel discussions in your classroom.

Web resources

Minnesota DNR wildlife population status reports
Status of Wildlife Populations, Fall 2007
files.dnr.state.mn.us/publications/wildlife/populationstatus2007/toc.pdf
Farmland Wildlife Populations
files.dnr.state.mn.us/publications/wildlife/populationstatus2007/ch1_07.pdf
Forest Wildlife Populations, 2007
files.dnr.state.mn.us/publications/wildlife/populationstatus2007/ch4_07.pdf
Carnivore Scent Station Survey and Winter Track Indices
files.dnr.state.mn.us/publications/wildlife/populationstatus2007/ch3_07.pdf
Migratory Bird Populations
files.dnr.state.mn.us/publications/wildlife/populationstatus2007/ch5_07.pdf
Hunting Harvest Statistics
files.dnr.state.mn.us/publications/wildlife/populationstatus2007/ch6_07.pdf

U.S. Geological Survey
www.usgs.gov/science/science.php?term=1333

National Audubon Society
www.audubon.org/bird/cbc/

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Fish populations
cybersalmon.fws.gov/tag1.htm

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

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

September–October 2003
“Big Lakes, Empty Skies”
www.dnr.state.mn.us/volunteer/sepoct03/biglakes.html

September–October 2006
“Duck Plan Fledges”
www.dnr.state.mn.us/volunteer/sepoct06/duck.html

September–October 2005
“Wetland Complexity”
www.dnr.state.mn.us/volunteer/septoct05/wetland_complexity.htm

November–December 2002
“Turkeys North”
www.dnr.state.mn.us/volunteer/novdec02/turkeysnorth.html

September–October 2003
“Moose Mystery”
www.dnr.state.mn.us/volunteer/sepoct03/moosemystery.html

September–October 2004
“Hunting for Results”
www.dnr.state.mn.us/volunteer/septoct04/results.html

July–August 2004
“About Those Bears”
www.dnr.state.mn.us/volunteer/julaug04/bears.html
See www.dnr.state.mn.us/young_naturalists/index.html for related Young Naturalists articles, many with study guides.

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

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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.

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.

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Study Questions

“Counting Critters” by Bob and Jan Welsh.

Published in the January–February 2008 Minnesota Conservation Volunteer,
or visit www.dnr.state.mn.us/young_naturalists/counting_critters/index.html

Name _____ Period _____ Date _____

1. When wildlife managers talk about wildlife populations, what do they mean? _____

2. Why is it important to monitor wildlife populations? _____

3. What is the best time of year to conduct aerial wildlife surveys? Why? _____

4. How did wildlife biologists estimate the number of moose in northern Minnesota? _____

5. Why do you suppose the annual loon survey is not taken until July? _____

6. How is the loon survey conducted? _____

7. Why aren't all the loons in Minnesota counted? _____

8. How does knowledge of the ring-necked pheasant's behavior help wildlife managers estimate this bird's population? _____

9. What other species are counted in the same manner as ring-necked pheasants? _____

10. What are anurans, and how are they surveyed? _____

11. Why are bullfrogs a threat to native frogs and toads? _____

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12. Why are dead bears used to estimate the number of live bears? _____

13. Explain what the numbers in this equation mean: $700 / .03 = 23,000$. _____

14. How is a wildlife survey different than a census? _____

15. What is an index, and why is it important in wildlife surveys? _____

16. What is drumming, and how is it used in surveying grouse? _____

17. Explain how scent station surveys are done. _____

Challenge: If 4 percent of bears killed were marked and 850 bears were marked, about how many bears are living in Minnesota? _____

What does a scent index of 2.3 mean? _____

Study Questions Answer Key

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1. When wildlife managers talk about wildlife populations, what do they mean? A wildlife population is all the members of a particular species living in a given area—for example, moose or wolves in northern Minnesota.
2. Why is it important to monitor wildlife populations? Habitat protection and hunting regulations are based on population numbers. Some species, such as the bald eagle, may need protection.
3. What is the best time of year to conduct aerial wildlife surveys? Why? Winter. The leaves are off trees and shrubs, making it easier to see animals.
4. How did wildlife biologists estimate the number of moose in northern Minnesota? They use helicopters to count the moose in 40 areas. They extrapolate their data to the larger population.
5. Why do you suppose the annual loon survey is not taken until July? Chicks do not hatch until then.
6. How is the loon survey conducted? Four hundred volunteers monitor 600 lakes in early July. They count all the loons they can find. Their data are extrapolated to the larger population.
7. Why aren't all the loons in Minnesota counted? There are more than 12,000 lakes in Minnesota. It would be difficult if not impossible to find enough volunteers to monitor every lake. Estimates are more efficient and are mathematically sound.
8. How does knowledge of the ring-necked pheasant's behavior help wildlife managers estimate this bird's population? On dewy mornings in early August pheasants bring their young to roadsides to dry off and warm up in the sun. They are therefore easier to count when the dew is heavy.
9. What other species are counted in the same manner as ring-necked pheasants? Gray partridge, eastern cottontails, and some others. (DNR population status reports cite data for white-tailed jackrabbits, white-tailed deer, and mourning doves.)
10. What are anurans and how are they surveyed? Anurans are frogs and toads. We survey them by listening to their songs.
11. Why are bullfrogs a threat to our frogs and toads? Bullfrogs compete for food and habitat. They also prey on smaller frogs and toads.
12. Why are dead bears used to estimate the number of live bears? It would be difficult and dangerous to count live bears.
13. Explain what the numbers in this equation mean: $700 / .03 = 23,000$. Of 700 bears killed, three percent (0.03) were marked. By dividing the total killed by the percent of the total marked, we can estimate the total number of bears (23,000).

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14. How is a wildlife survey different than a census? A survey is an estimate of a population, while a census is a count of every animal or person.
15. What is an index, and why is it important in wildlife surveys? An index is a number that is calculated by dividing the number of animals counted by the number of observations made. For example, if a rugged grouse surveyor counted two grouse for every 100 observations, the index would be two percent (0.02). That index can then be applied to a wide area to allow wildlife managers to estimate the population without trying to count every grouse.
16. What is drumming and how is it used in surveying grouse? Male ruffed grouse beat their wings rapidly, which produces a drumming sound. Surveyors count the number of drummings in an area to estimate the number of male grouse.
17. Explain how scent station surveys are done. One-meter circles of sifted soil with scented pellets in the middle are plotted along a country road. When animals stop to check the scent they leave tracks, which can then be counted.

Challenge: If 4 percent of bears killed were marked and 850 bears were marked, about how many bears are living in Minnesota? $850 / .04 = 21,250$ bears. What does a scent index of 2.3 mean? Of all the stations, 2.3 percent were visited by the species being counted.

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Minnesota Comprehensive Assessments Practice Items

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Name _____ Period _____ Date _____

- _____ fly planes and helicopters to find animals in the wild.
 - Wildlife managers
 - Conservation officers
 - Wildlife biologists
 - None of the above
- The bullfrog’s native range includes _____.
 - northwestern Minnesota
 - northeastern Minnesota
 - southeastern Minnesota
 - southwestern Minnesota
- Hunters must turn in _____ and _____ from bears they have killed.
 - ears and noses
 - teeth and ribs
 - claws and tails
 - teeth and brains
- Wildlife managers bait bears with _____.
 - sweet rolls
 - rotten meat
 - bacon
 - apples
- To extrapolate means to _____.
 - predict the larger population based on a small survey
 - give extra attention to the survey
 - count every animal
 - never be on time

Minnesota Comprehensive Assessments Answer Key

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Minnesota Conservation Volunteer, or visit www.dnr.state.mn.us/young_naturalists/tktktktktk

- B. Conservation officers fly planes and helicopters to find animals in the wild.
- The bullfrog’s native range includes C. southeastern Minnesota.

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3. Hunters must turn in B. teeth and ribs from bears they have killed.
4. Wildlife managers bait bears with C. bacon.
5. To extrapolate means to A. predict the larger population based on a small survey.

Vocabulary

“Counting Critters” by Bob and Jan Welsh. Published in the January–February 2008 Minnesota Conservation Volunteer, or visit www.dnr.state.mn.us/young_naturalists/tkktktktk

Minnesota Comprehensive Assessments Practice Items Answer Key

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1. B. Conservation officers fly planes and helicopters to find animals in the wild.
2. The bullfrog’s native range includes C. southeastern Minnesota.
3. Hunters must turn in B. teeth and ribs from bears they have killed.
4. Wildlife managers bait bears with C. bacon.
5. To extrapolate means to A. predict the larger population based on a small survey.

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Vocabulary

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abundant present in great quantities

conservation officer a person who is responsible for enforcing natural resource laws and aerial monitoring moose, deer, beaver and pheasant populations

cycle sequence of events repeated again and again

data information obtained from experiments or surveys

ingenuity cleverness or originality

proportion quantity of something that is part of a whole amount

ritual actions performed in a set, ordered way

rookery actions performed in a set, ordered way

species animals that may interbreed

waterfowl birds that swim on water

wetland marsh or swamp

wildlife biology an approach to the study of wild animals and their habitats

wildlife manager a person who manages, protects, and regulates fish and wildlife resources

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Vocabulary Study Cards

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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 be
abundant
means to be

To be
**present in
great quantities**
is to be

A
conservation officer
is one who

A person who
**enforces natural
resource laws**
is a

A
cycle
in nature is a

In nature a
**sequence of events
repeated again and
again**
is a

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In science the word
data
refers to

**Information, often in
the form of facts obtained
from experiments or surveys,**
is referred to as

Ingenuity
is

Cleverness or originality
is

A
proportion
is a

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

A
proportion
is a

A
**quantity of something
that is part of a
whole amount**
is called a

Wildlife biology
is the study of

The study of
**wild animals and
their habitats**
is

A
wildlife manager
is one who

A person who
**A person who
manages, protects, and
regulates fish and
wildliferesources**
is called a