Young Naturalists

Teachers Guide

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"Nature's Recyclers" Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article "Nature's Recyclers" by Mary Hoff. Published in the July–August *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/natures_recyclers.

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.mndnr.gov/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

"Nature's Recyclers" describes the organisms that break organic matter into its constituent parts. Readers will learn about detritivores, such as turkey vultures, bullheads, and houseflies; and decomposers, such as mushrooms, and bacteria.

Suggested reading levels:	fifth through eighth grades
Total words:	1,398
Materials	Paper, poster board, pencils, pens, markers, print resources from your media center, compostable materials, and potting soil
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:

"Nature's Recyclers" may be applied to the following Minnesota Department of Education standards:

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

Science
Grades 5, 7 and 8
IV. Life Science
F. Flow of Matter and Energy

Social Studies
Grades 4–8
V. Geography
D. Interconnections: The student will describe how humans influence the environment and in turn are influenced by it.

Arts
All grades
Artistic Expression
D. Visual Arts

Complete Academic Standards are available at www education.state.mn.us. Teachers who find other connections to academic standards are encouraged to contact *Minnesota Conservation Volunteer.*

Preview

To provide an example of decomposition, bring an assortment of kitchen scraps (carrot peels, onion skins, melon rinds) and potting soil to class. Ask students to offer explanations for the transformation of kitchen waste into soil. Display their ideas on poster board and post while you are working on this story.

Use the KWL strategy (Ogle, 1986) to find out what your students already know (K) about decomposition, 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 their ideas. Then combine the groups' data 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. Individual organizers may be useful as students read the article for answers to W questions. KWL also gives you the opportunity to introduce interdisciplinary connections you 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.

If you have a school forest or are within walking distance of a wooded area, walk through the woods. Find an undisturbed area. Carefully peel away successive layers of duff to reveal the soil. Invite discussion of what processes account for the decomposition of dead leaves and plants. During your walk, add items to the K and W categories.

Vocabulary preview

See the copy-ready vocabulary list included in this guide as well as italicized words in the article. 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 students 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. Also, preview the study questions for unfamiliar terms.

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 1, 2, 7, 8, 11, and 13 and the Challenge 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 write an essay describing the decomposition process. (2) Students may write an essay comparing and contrasting detritivores and decomposers. (3) Students may write multiple-choice, short answer, or true–false questions to test their classmates' understanding of the story. Student-generated questions may be then used as an alternative to study questions. (4) Poster presentations may illustrate how dead bodies of animals and dead plants are recycled back into the environment.

Extension activities

1. On page 47 the author writes, "This cycle of life frees nitrogen, phosphorus, carbon, hydrogen, and other elements that make up plants, animals, and other living organisms." What is an element? What are other the elements in living organisms? Challenge students to discover the answers and to highlight the elements on the periodic table of the elements.
2. Visit the wastewater treatment plant in your community. How is the organic waste that goes down your drains recycled? What role do nature's recyclers play?
3. Another inexpensive field trip could be to your community yard-waste composting site. If your community does not compost yard waste students may research the composting process. You may wish to compost kitchen scraps or yard waste in your classroom.
4. Research: What animals engage in coprophagy? What is the adaptive value?
5. Research: Why do scientists study how the human body decomposes? How is this knowledge applied to solving crimes?
6. See page 53 of the book for a description of a "Rot-a-thon" activity.

Web resources

Detritivores
www.ladybird-survey.pwp.blueyonder.co.uk/Detritiv.htm

Decomposers
www.qrg.northwestern.edu/projects/MarsSim/SimHTML/info/whats-a-decomposer.html
www.sheppardsoftware.com/content/animals/kidscorner/foodchain/decomposers.htm
www.teachersdomain.org/resource/tdc02.sci.life.oate.decompose/

Forensic Science of Decomposition
www.enotes.com/forensic-science/decomposition

Food Webs
www.vtaide.com/png/foodchains.htm
www.harcourtschool.com/activity/food/food_menu.html

Elements in Living Organisms
www.rsc.org/education/teachers/learnnet/cfb/basicchemistry.htm

Wastewater Treatment
ga.water.usgs.gov/edu/wuww.html

Composting
www.reduce.org
vegweb.com/composting
www.epa.gov/wastes/conserve/rrr/composting/index.htm
www.howtocompost.org

Coprophagy
www.springerlink.com/content/mlvngh78u55311t7

Lesson Plans
sciencespot.net/Pages/nclsslnks.html
www.mysciencebox.org/foodchain/lesson

Teacher resources
www.mndnr.gov/education/teachers/index.html

Related articles

Many related *Minnesota Conservation Volunteer* articles are available online at www.mndnr.gov/magazine/articles/index.html, including:

September–October 2002
"The Universe Underfoot" (YN article with teachers guide)
www.mndnr.gov/young_naturalists/soil/index.html

September–October 2005
"The Secret Lives of Fungi"
www.mndnr.gov/volunteer/article_index/articledetail.html?article_id=2157

May–June 2006
"Natural Curiosities"
www.mndnr.gov/volunteer/mayjun06/curiosities.html

May–June 2007
"Ants" (YN article with teachers guide)
www.mndnr.gov/young_naturalists/ants/index.html

May–June 2008
"Spring-to-Life Ponds"
www.mndnr.gov/young_naturalists/ponds/index.html

May–June 2009
"Natural Curiosities"
www.mndnr.gov/volunteer/mayjun09/curiosities.html

January–February 1992
"Connoisseurs of Compost"
This article is not available online. To request a hard copy, please send the name of the article, month and year of publication, and your mailing address to mcvarticles@dnr.state.mn.us.

References

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.

Study Questions

Teachers guide for the Young Naturalists article "Nature's Recyclers" by Mary Hoff. Published in the July–August *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/natures_recyclers.

Name_____Period_____Date_____

1. Why are maggots and bacteria so important? _____

_____

_____

2. What do you have in common with peacocks and oak trees? _____

_____

_____

_____

3. Snails and crows are _____.

4. How do turkey vultures find their next meal? _____

_____.

5. Why don't turkey vultures get sick from eating rotten meat? _____

_____

_____

6. Turkey vultures do not have feathers on their heads. Why not? _____

_____

_____

7. What are barbels, and why are they important? _____

_____

_____

8. Why must American toad tadpoles grow quickly? _____

_____

9. House flies benefit from laying their eggs in manure because _____

_____

_____.

10. How do deer antlers benefit deer mice? _____

_____

_____

_____

11. What do deer mice have in common with dung beetles? _____

12. How does the turkey tail mushroom decompose wood? _____

_____

_____

_____

13. Where does the antibiotic streptomycin come from? _____

_____

14. What two organisms combine to form lichens? _____

Challenge: Why is it beneficial to deer mice to wear their teeth down by gnawing hard materials?

_____

_____

_____

_____

Study Questions Answer Key

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1. Why are maggots and bacteria so important? **Answers may vary, but should include that other organisms could not survive with the nutrients, clean water, and fresh air that recyclers provide.**

2. What do you have in common with peacocks and oak trees? **Your body may contain elements that once were part of a peacock's body or were in an oak tree.**

3. Snails and crows are **detritivores.**

4. How do turkey vultures find their next meal? **They use their sense of smell to detect ethyl mercaptan, a gas given off by rotting flesh, and their sense of sight to home in on the meal.**

5. Why don't turkey vultures get sick from eating rotten meat? **They have strong acids in their stomachs that kill harmful bacteria.**

6. Turkey vultures do not have feathers on their heads. Why not? **If they had feathers on their heads they would have a hard time keeping clean. They stick their heads inside rotting bodies.**

7. What are barbels, and why are they important? **Barbels are a bullhead's whiskers. They help the fish find food by tasting things on the bottom of the lake or river that might be food.**

8. Why must American toad tadpoles grow quickly? **Ponds they grow in may dry up quickly.**

9. House flies benefit from laying their eggs in manure **because their larvae eat the manure as they grow into pupae and then into adult flies.**

10. How do deer antlers benefit deer mice? **The mice eat antlers, which provide important nutrients and also help mice wear down their teeth.**

11. What do deer mice have in common with dung beetles? **They both eat dung.**

12. How does the turkey tail mushroom decompose wood? **It sends out threads called hyphae into the dead wood. The hyphae produce enzymes that break down the wood cells into hydrogen, oxygen, and carbon.**

13. Where does the antibiotic streptomycin come from? **Streptomycin comes from *Streptomyces* bacteria.**

14. What two organisms combine to form lichens? **Lichens are fungi and algae combined.**

Challenge: Why is it beneficial to deer mice to wear their teeth down by gnawing hard materials? **This one may take a bit of research. Rodents such as deer mice must gnaw on hard materials because their teeth grow throughout their lifetimes. Without constant gnawing their teeth would grow through their upper and lower jaws.**

Minnesota Comprehensive Assessments Practice Items

Teachers guide for the Young Naturalists article "Nature's Recyclers" by Mary Hoff. Published in the July–August *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/natures_recyclers.

Name _____Period _____Date_____

1. The brown bullhead eats mainly at _____.
   A. 7:00 a.m.
   B. night
   C. noon
   D. any time of the day or night

2. What do crows and foxes have in common? _____

   _____

   _____

3. American toad tadpoles eat mostly _____.
   A. dead leaves
   B. other tadpoles
   C. house flies
   D. water

4. How are maggots used to help wounded people? _____

   _____

   _____

   _____

5.Turkey tail mushrooms are being studied to help fight _____.
   A. diabetes
   B. the common cold
   C. asthma
   D. cancer

Minnesota Comprehensive Assessments Answer Key

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1. The brown bullhead eats mainly at **B. night.**
2. What do crows and foxes have in common? **They are both detritivores, which means they eat dead animals.**
3. American toad tadpoles eat mostly **A. dead leaves.**
4. How are maggots used to help wounded people? **Maggots are place on severe wounds to eat dead tissue around the edges of the wound.**
5. Turkey tail mushrooms are being studied to help fight **D. cancer.**

Vocabulary

Teachers guide for the Young Naturalists article "Nature's Recyclers" by Mary Hoff. Published in the July–August *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/natures_recyclers.

cellulose	main material of cell walls of plants and algae
dung	feces, manure, solid animal waste
element	a substance that cannot be broken down into a simpler substance
emanate	come from or come out of
enzyme	protein produced by living cells that promotes biochemical reactions
fungi	organisms without chlorophyll that reproduce by spores and absorb nutrients from organic matter
immune system	the body's way of recognizing and fighting objects that are not part of itself
larva	immature form of many insects that develops into a pupa
nutrients	any substance that provides nourishment—for example, the minerals plants or animals need to grow
molecule	smallest physical unit of a substance; one or more atoms held together by chemical forces
organism	a living thing, such as a plant, animal. or bacterium
pupa	insect stage between larva and adult

Vocabulary Study Cards

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Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

What is **cellulose?**	FOLD HERE	What is **the main material of cell walls of plants and algae** called?
What is **dung**?	FOLD HERE	**Feces, manure, or solid animal waste** is called
What is a chemical **element**?	FOLD HERE	**A substance that cannot be broken down into a simpler substance** is an

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Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

To **emanate** means to	FOLD HERE	To **come from or come out of** is to
What is an **enzyme?**	FOLD HERE	A **protein produced by living cells that promotes biochemical reactions** is an
Fungi are	FOLD HERE	**Organisms without chlorophyll that reproduce by spores and absorb nutrients from organic matter** are

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Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

What is the **immune system**?	FOLD HERE	**The part of the body that recognizes and fights objects that are foreign** is called the
What are **nutrients**?	FOLD HERE	**Substances that provide nourishment (for example, the minerals plants or animals need to grow)** are
What is a **molecule**?	FOLD HERE	**The smallest physical unit of a substance; one or more atoms held together by chemical forces** is a

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Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

An **organism** is	FOLD HERE	**A living thing, such as a plant, animal, or bacterium** is an
The **pupa** is the	FOLD HERE	The **insect stage between larva and adult** is the
What is a **larva**?	FOLD HERE	The **immature form of many insects, which develops into a pupa**, is called the

Vocabulary Study Cards

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Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

FOLD HERE

FOLD HERE

FOLD HERE