



## Nature's Recyclers Lessons

### Websites

#### General, Kid-Friendly Web Sites

##### [Microbe Zoo](#)

This site features the following attractions: DirtLand, Animal Pavilion, Snack Bar, Space Adventure, and Water World. Each provides examples of microbes (bacteria and fungi) that thrive in the particular environment described.

( <http://commtechlab.msu.edu/sites/dlc-me/zoo/> )

##### [Nature's Recyclers Coloring Book](#)

Follow this web link to a PDF file for "Nature's Recyclers Coloring Book," which you can print and distribute in class.

( <http://www.dnr.state.wi.us/org/caer/ce/eeek/cool/natrec.htm> )

##### [Natureworks: Decomposers](#)

Drawn from an episode of Natureworks ( New Hampshire public television), this web page begins: "When plants and animals die, they become food for decomposers like bacteria, fungi, and earthworms." It then describes each of the three types of organisms.

( <http://www.nhptv.org/natureworks/nwep11b.htm> )

##### [Soils Zoo](#)

This site offers clear photographs of some of the different organisms that live in the soil. It features predators, tunnellers (including earthworms and dung beetles), grazers (including springtails and nematodes), and microbes (including fungi and bacteria).

( <http://www.adelaide.edu.au/agcareers/Content/TeacherResources/WhatareSoils/zoo.htm> )

##### [Welcome to the Mushroom Club](#)

This kid-friendly site offers games, recipes, experiment ideas and information about mushrooms and other types of fungi.

( [http://herbarium.usu.edu/fungi/FunFacts/Mushroom\\_Club.htm](http://herbarium.usu.edu/fungi/FunFacts/Mushroom_Club.htm) )



### [Animal Games for Kids – Kids Corner](#)

A great child-friendly website that offers a variety of animal games to reinforce what children have learned in the classroom. Game topics include: animal classification, producers and consumers, food chain, animal diet, endangered animals, and animal characteristics.  
( <http://www.sheppardsoftware.com/content/animals/kidscorner/gamesforkids.htm> )

### **Reference for Teachers**

#### [Decomposition](#)

This site explains the process and importance of decomposition and contains images of a rabbit decomposing over several months.  
( <http://www.countrysideinfo.co.uk/decompos.htm> )

#### [Forest Floor Terrarium](#)

This site explains how to set up a forest floor terrarium in the classroom.  
( <http://www.cas.muohio.edu/scienceforohio/Terrarium/index.html> )

#### [There's Life in Dead Trees](#)

These sites provide detailed information about rotting logs.  
( <http://www.fs.fed.us/r6/nr/wildlife/animalinn/whattodo.htm> )

#### [Oetzi the Iceman](#)

This site contains information and links to other sites about the world's oldest and best-preserved mummy. Believed to be 5,300 years old, the Iceman was discovered in 1991 in the Italian Alps.  
( <http://www.crystalinks.com/oetzi.html> )

#### [Rotten Luck: The Role of Downed Wood in Ecosystems](#)

Download a short, well illustrated brochure that describes the important roles played by fallen trees.  
( <http://www.for.gov.bc.ca/hfd/pubs/Docs/Bro/Bro24.htm> )

### **Earthworms and Other Invertebrates**

#### [Crayfish in the Classroom](#)

This web site describes how to catch, keep, feed, and care for keep crayfish in the classroom.  
( <http://www.naturenorth.com/fall/crayfish/Fcraycl.html> )



### [Wiggly Worms](#)

This website provides links to a variety of worm activities, including how children can make their own "Worm Hotel."

( <http://homeschooling.gomilpitas.com/explore/worms.htm> )

### [Worm Bin Creatures](#)

These sites contain excellent pictures and information about organism that can be found in a worm bin.

( <http://mypeoplepc.com/members/arbra/bbb/id16.html> )

### **Fungi and Bacteria**

#### [Classroom Clipart: Fungi](#)

This site contains clipart of various types of mushrooms that can be used as visuals in the classroom.

( <http://classroomclipart.com/cgi-bin/kids/imageFolio.cgi?direct=Plants/Fungi&img=0> )

#### [North American Mycological Association](#)

This website offers an array of downloadable activities and publications.

( <http://www.namyco.org/education/k-12.html> )

#### [Tom Volk's Fungi](#)

This site provides an incredible amount of information about fungi.

( [http://botit.botany.wisc.edu/toms\\_fungi/](http://botit.botany.wisc.edu/toms_fungi/) )

### **Composting**

#### [The New York City Compost Project](#)

This site contains extensive information about composting.

( <http://www.nyccompost.org/program/index.html> )

#### [The Decomposition Process](#)

This web site offers a comprehensive overview of composting, including distinctions between aerobic and anaerobic decomposition, requirements for efficient decomposition, and organisms in composting.

( <http://aggie-horticulture.tamu.edu/extension/compost/chapter1.html> )



**Vermicomposting**

This site explains how to compost with earthworms.  
( [http://journeytoforever.org/compost\\_worm.html](http://journeytoforever.org/compost_worm.html) )



## Nature's Recyclers Lessons

### Books

If you have a budget for purchasing books, Science Companion especially recommends these titles to supplement the lessons:

- **A Dead Log (Small Worlds)** by Jen Green
- **The Magic School Bus Meets the Rot Squad: A Book About Decomposition** by Joanna Cole
- **Wormology** by Michael Elsohn Ross

#### **Decomposition and Nutrient Recycling**

The books listed below offer comprehensive information about the organisms and processes involved in decomposition and nutrient cycling.

#### **Compost Critters**

By Bianca Lavies. (1993, Dutton Books)

This grade-appropriate book describes what happens in a compost pile and how creatures, from bacteria and mites to millipedes and earthworms, aid in the process of turning compost into humus.

#### **Dirt (Jump into Science)**

By Steve "The Dirtmeister" Tomecek; illustrated by Nancy Woodman. (2002, National Geographic Children's Books)

This age-appropriate and informative book features lively illustrations of a star-nosed mole, who guides readers through the underground world. Readers find out what makes up soil, what lives in soil, how soil helps things grow, and how soil forms. They also learn why soil is sometimes at risk.

#### **Dirt: The Scoop on Soil**

By Natalie M. Rosinsky; illustrated by Sheree Boyd. (2002, Picture Window Books)

Illustrated with simplistic pictures, this book describes what soil is made of and briefly explains that decomposers put "more food back into the humus." Available in a Spanish language edition.



### **Dirty, Rotten, Dead?**

By Jerry Emory; illustrated by T. Taylor Bruce. (1996, Hartcourt)

This book discusses death, decomposition, and life with dramatic large-size illustrations of nature in action.

### **Everyone Poops (My Body Science Series)**

By Taro Gomi; translated by Amanda Mayer Stinchecum. (2001, Kane/Miller Book Publishers)

Written for a preschool audience, this book makes an important point that even elementary students need to remember: everyone poops.

### **The Gift of the Tree**

By Alvin Tresselt; illustrated by Henri Sorenson. (1992, HarperCollins)

Originally published under the title *The Dead Tree*, this book captures the role of an oak tree in the cycle of nature, as a living tree, a decomposing organism, and a source of support for new life.

### **The Giggler Treatment**

By Roddy Doyle; illustrated by Brian Ajhar. (2001, Arthur A. Levine Books)

Indulge your class's sense of humor, and read them this book. An excerpt: "The Gigglers have always been there. Since the first dog did its first poo. Since the first caveman grunted at his first cave child. He stomped out of the cave, straight onto a huge lump of prehistoric poo."

### **A Handful of Dirt**

By Raymond Bial. (2000, Walker & Company)

This informative book introduces readers to dirt dwellers, from the tiniest protozoan through myriad invertebrates to the mammals and reptiles whose burrows aerate the earth. All are depicted in large, sharp, full-color photographs.

### **In the Woods: Who's Been Here?**

By Lindsay Barret George. (1998, Greenwillow Books)

This is a beautifully illustrated book about a girl, a boy, and their dog exploring the autumn woods. The reader will be drawn into the brilliant lifelike illustrations noticing such things as an empty nest, a gnawed branch, feathers, and bones.



### **Life in a Bucket of Soil**

By Alvin Silverstein and Virginia Silverstein. (2000, Dover Publications)

This fascinating book introduces students to industrious ants, tunnel-building earthworms, snails and slugs, beetles, and many other creatures inhabiting and affecting the soil.

### **A Log's Life**

By Wendy Pfeffer; illustrated by Robin Brickman. (2007, Aladdin)

This beautifully illustrated book details the life, death, and decay of an oak tree. The short story traces how animals use the log for food and shelter, and shows how the log eventually crumbles and becomes soil.

### **The Magic School Bus Meets the Rot Squad: A Book About Decomposition**

By Joanna Cole; illustrated by Bruce Degen. (1995, Scholastic)

In this age-appropriate book, the students in Ms. Frizzle's class tour a decomposing log to find out that nature recycles through the process of decomposition.

### **One Small Square: Backyard**

By Donald M. Silver; illustrated by Patricia J. Wynne and Dianne Ettl. (1997, McGraw Hill)

Part of the critically acclaimed One Small Square series, this book illustrates and describes the numerous organisms that live in the soil and plants of a backyard. It includes the animals and microorganisms that recycle leaf litter, animal droppings, and dead plants and animals.

### **Sea Otter Inlet**

By Celia Godkin. (2001, Fitzhenry and Whiteside Limited)

This well-illustrated story tells what happens when hunters decimate a sea otter population. The sea urchins (an otters' favorite food) multiply and devour the kelp beds, so that ultimately no creature can survive there...until a new group of otters arrives.

### **Under One Rock: Bugs, Slugs and other Ughs**

By Anthony D. Fredericks and Jennifer Dirubio. (2001, Dawn Publications)

This book for early-elementary readers contains an engaging story and vivid, close-up illustrations about an incredible community of organisms found living under rocks.



### **What's Living in Your Classroom? (Hidden Life)**

By Andrew Solway. (2005, Heinemann Library)

Part of the Hidden Life series, this book provides magnified photographs of microscopic organisms that may be living in your classroom. It includes a chapter on "Microbes in Muck," which focuses on bacteria and fungi that live in dung and can be tracked in on shoes. Another chapter on "Microbe-Packed Food," illustrates the fungi and bacteria used to make the cheese sandwich that may be packed in a lunch. This book would work well as a supplement to the "Agents of Decomposition" lesson.

### **Beetles**

#### **Beetles: The Most Common Insects (Animals in Order)**

By Sara Swan Miller. (2000, Franklin Watts)

This book could help students find and identify beetles during the field trip in the Evidence of Decomposition lesson. A two-page spread on each of 14 different beetles is organized according to the environment where beetles live: in the woods, in fields and gardens, in ponds and streams, and under the ground. It includes a section about carrion beetles.

#### **Beetles (True Books)**

By Ann O. Squire. (2004, Children's Press)

Full-color photographs make this book a good resource. It includes a section about dung beetles.

#### **Dung Beetles (Really Wild Life of Insects)**

By Andrew Hipp. (2003, Powerkids Press)

If any students in your class get really interested in dung beetles, look for this book in your library. They will be able to read it themselves and become experts on these nature's recyclers.

### **Fungi**

#### **Discovering Fungi (Discovering Nature Series)**

By Jennifer Coldrey. (1988, Bookwright)

This age-appropriate reference book describes the characteristics of fungi, places where fungi are found, the many varieties that exist, and their relationship to animals and human beings.





### **Fungi**

By Mary Kay Carson. (2007, Newbridge Educational Publishing)

An educational introduction to the kingdom of Fungi, this book features excellent photographs of mushrooms, mold, and mycelium. It includes a two-page spread that addresses the role of fungi as decomposers.

### **Katya's Book of Mushrooms**

By Katya Arnold and Sam Swope. (1997, Henry Holt and Company)

This oversize title, containing brightly colored artwork and cheerful, anecdotal text, introduces a variety of wild mushrooms as it describes the author's childhood experiences in Russia gathering and eating them. Mushrooms are defined, specific types are identified, and much information and folklore are added.

### **A Kid's Guide to the Classification of Living Things: Fungi**

By Elaine Pascoe; photographs by Dwight Kuhn. (2003, Powerkids Press)

This book discusses the characteristics of fungi and describes specific member of this class, including mushrooms, molds, and lichens.

### **Mushrooms**

By Silvia A. Johnson; photographs by Masana Izawa. (1982, Lerner Publications Company)

This book for upper-elementary readers contains excellent photographs of different types of mushrooms.

### **Mushrooms and Mold (Let's-Read-and-Find-Out Science)**

By Robert Froman; illustrated by Grambs Miller. (1972, Thomas Y. Crowell Company)

Although this book may be out of print, it is a perfect reference book for the less skilled readers in the class. Illustrations accompany simple explanations of the life cycles of mold and mushrooms.



## **Earthworms**

### **Diary of a Worm**

By Doreen Cronin; illustrated by Harry Bliss. (2003, HarperCollins)

Written like a diary from a young worm's point of view, and illustrated by a cartoonist, this hilarious book introduces young readers to earthworms. The life of an average worm seems mundane and common to the worm, but for the reader it relates a few facts about earthworms and their behavior, all with a dry sense of humor. You and your students will enjoy this book.

### **Earthworms**

By Claire Llewellyn and Barrie Watts. (2002, Children's Press)

This book for early-elementary readers contains large colorful photographs and information about the life cycle and behavior of earthworms.

### **An Earthworm's Life**

By John Himmelman. (2001, Children's Press)

This book for early-elementary readers describes, in simple text and exceptional illustrations, the daily activities and life cycle of the earthworm.

### **How to Eat Fried Worms**

By Thomas Rockwell. (2006, Yearling)

A fictitious, humorous book aimed at the sensibilities of a ten-year old boy. In the story, Billy makes a bet that he will eat 15 worms in 15 days.

### **Wiggling Worms at Work (Let's-Read-and-Find-Out Science)**

By Wendy Pfeffer. (2003, HarperCollins)

This book for early-elementary readers discusses the earthworm's habits, anatomy, locomotion, food, and life cycle, as well as explaining the importance of castings and tunneling in maintaining soil richness, moisture, and aeration. The final pages encourage children to explore earthworms on their own by closely observing a worm and a tunnel entrance and by planting seeds in ordinary soil and in soil enriched with worm castings.



### **The Worm Book**

By Loren Nancarrow and Janet Hogan Taylor. (1998, Ten Speed Press)

This comprehensive reference book for teachers is a complete guide to gardening and composting with worms.

### **The Worm Café, Mid-Scale Vermicomposting of Lunchroom Wastes**

By Binet Payne. (1999, Flower Press)

This manual describes how a teacher and her students developed a system to compost lunchroom waste with worms and save their school \$6,000 per year.

### **Wormology**

By Michel Elsohn Ross, Brian Grogan, and Darren Drickson. (1996, Carolrhoda Books)

This book provides information about earthworms' habitat, ecology, physical characteristics, senses, movement, reproduction, regeneration, feeding, and respiration. It mixes factual passages with inquiry-based activities that could be carried out with the help of teachers, parents, and friends.

### **Worms Eat My Garbage: How to Set Up & Maintain a Worm Composting System**

By Mary Appelhoff. (1997, Flower Press)

This reference book for teachers provides complete illustrated instructions on setting up and maintaining small-scale worm composting systems. Topics include types of bins, what kind of worms to use, the life cycle of a worm, worm beddings, feeding worms, harvesting worms, and making potting soil from the vermicompost produced.

### **DVD**

#### **Microcosmos**

Directed and filmed by Claude Nurispany and Marie Perennou. (2005, Miramax/Walt Disney Home Video)

Released in France in 1996, this minimally narrated film chronicles the insect world. Fast-forward to the middle, and show your class the segment featuring a dung beetle persistently trying to roll a ball of dung uphill and over a pointed stick.