



By Mary Hoff

**VULTURES AND FUNGI**, maggots and bacteria. When you think of the wonders of nature, creatures like these might not be at the top of your list. But they really are wonder-full. They are nature's recyclers. They turn *detritus*—dead bodies, waste products, and other things that once were part of living plants or animals—into air, water, and nutrients. Without

# NATURE'S

# recyclers

this demolition crew, living things would quickly run out of the building blocks everyone needs to survive and thrive.

This cycle of life frees nitrogen, phosphorus, carbon, hydrogen, and other elements that make up plants, animals, and other living organisms. Then those atoms can become part of other living things. Many of the atoms inside your cells and tissues were once inside something else. You might contain carbon that used to be part of a peacock, or hydrogen that was once trapped in an oak tree. Thanks to nature's recyclers, a peacock's carbon and an oak tree's hydrogen can be recycled and made available to become part of you too.

Nature's recyclers come in two main kinds: *detritivores* and *decomposers*. This story tells about some of them and how they work.

FROM TOP LEFT TO BOTTOM RIGHT: TURKEY VULTURE BY ALLEN BLAKE SHELDON, FUNGUS BY DOMINIQUE BRAUD, ORANGE JELLY FUNGUS BY BILL JOHNSON, DEER MOUSE BY ALLEN BLAKE SHELDON





**DETRITIVORES** are animals that eat detritus. They tear, chew, and grind once-living things into tiny pieces. With the help of bacteria inside them, these animals use some of the bits to build their own bodies. Then they send the rest of the bits through their digestive tracts and back out into the world. Snails, crows, foxes, and dung beetles are all detritivores.

DOMINIQUE BRAUD



ALLEN BLAKE SHELDON



ALLEN BLAKE SHELDON



Detritivores are not picky eaters. A red fox will eat road-killed mice, birds, and other animals. Dung beetles roll dung and other refuse into a ball for food. A crow will pick up leftovers of all kinds, from rotting fruit to dried spaghetti.



TURKEY VULTURE BY DOMINIQUE BRAUD

**TURKEY VULTURES** (*Cathartes aura*)

**THE ROTTEN TRUTH:**

When a turkey vulture feels threatened, it throws up.

It's a steamy summer day. Waves of heat rise from the road pavement into the air above. With them rises the odor emanating from a very flat raccoon—roadkill.

Flying above the highway, a turkey vulture catches the scent of *ethyl mercaptan*, a gas given off when dead things start to rot. Searching the land below, the big bird

spies the dead raccoon and swoops in.

Stepping on the raccoon to hold it in place, the vulture tears at the skin and muscle with its hooked beak. It sticks its almost bald head into the dead animal. It grabs and gobbles up bits of flesh. Special strong acids in its stomach kill the bacteria that are giving the raccoon its funny smell, so the vulture won't get food poisoning. When the vulture finishes its meal, it sits in the sun. The sun bakes the dried blood from the vulture's bald head, helping prevent disease-causing bacteria from growing on it.

**BROWN BULLHEADS** (*Ameiurus nebulosus*)

These fish live at the bottom of lakes and rivers. A brown bullhead eats mainly at night, feeding mostly on aquatic insects and small fish. But a bullhead will eat pretty much anything it can find and fit into its mouth. "Anything" includes dead fish, dead insects, and other detritus.

If you look a bullhead in the face, you

will see that it has eight wormlike attachments sprouting out from around its mouth. These attachments, called *barbels*, have taste buds. The bullhead can wiggle two of these barbels as it swims along the lake or river bottom. When it tastes something that could be food, the bullhead eats it.



BROWN BULLHEAD BY ERIC ENGBRETSON

**THE ROTTEN TRUTH:**  
A bullhead has taste buds covering its entire body.

**THE ROTTEN TRUTH:**

In one Minnesota study, detritus made up almost three-quarters of the food of American toad tadpoles.



ALLEN BLAKE SHELDON

In May, female American toads lay long strings of eggs that hatch into tadpoles (left). The tadpoles get nutrition from tiny bits of dead leaves they suck in with water. By late June or early July, tiny toadlets emerge from wetlands to feed on invertebrates in surrounding upland habitats.

**AMERICAN TOAD TADPOLES** (*Bufo americanus*)

In early spring, as the snow melts, puddles form in low places. American toads lay their eggs in the standing water. When tadpoles hatch from the eggs, they begin eating and growing.

What do you think they find to eat in the temporary puddles or ponds? If

you are thinking dead leaves, you are right! When a tadpole sucks water into its mouth, bits of dead leaves follow along. The leaf bits get trapped in mucus inside its mouth. The tadpole uses the energy and nutrients from the dead leaves to grow.

**THE ROTTEN TRUTH:**

Some kinds of fly maggots are used in medicine to help severe wounds heal by eating the dead tissue around the edges.



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**HOUSE FLY LARVAE** (*Musca domestica*)

What better place to lay eggs than where lots of food will be available for the little ones to eat when they hatch? House flies have that plan figured out. They lay their eggs in manure, dog droppings, garbage, and bodies of dead things. When their

wormlike larvae, called *maggots*, hatch out from the eggs, they start to eat the tasty treat. After about five days of feeding, a maggot turns into a pupa. After another one to two weeks, a fly emerges, ready to fly off and lay eggs of its own.

**THE ROTTEN TRUTH:**

A deer mouse sometimes eats its own droppings. This behavior, called *coprophagy*, allows it to get more nutrients out of its food the second time around.



ALLEN BLAKE SHELDON

**DEER MICE** (*Peromyscus maniculatus*)

Deer mice eat lots of living things, such as plant seeds and insects. But they also will nibble on a dead animal if they find one.

After white-tailed deer shed their antlers in late winter, deer mice gnaw at them. The

antlers provide calcium, phosphorus, and protein that the deer mice need to stay healthy. Gnawing on antlers also helps keep the deer mouse's teeth from growing too long.



**DECOMPOSERS** are not animals. They are other living things, such as bacteria and fungi. For example, bread mold and mushrooms are decomposers. Decomposers make chemicals that turn proteins, fats, and other big molecules into small molecules. Other living things, such as fish, frogs, and you, can use these small molecules to build new proteins, fats, and other big molecules for themselves.



RON SPINOSA

### TURKEY TAIL MUSHROOM (*Trametes versicolor*)

If you've ever seen a rotting log, you probably have seen this mushroom. But you may not have known its name. Turkey tail grows on dead branches and stumps everywhere. The part you see—the fruiting body—grows in fanned layers out from the wood. It has bands of color, like the tail feathers of a turkey. The edge is often whitish. The underside is whitish too.

Turkey tail breaks down *lignin*, one of the compounds that makes wood strong. It does this by sending *hyphae*, microscopic threads, in between the cells of the dead wood.

The hyphae give off enzymes that break lignin down into hydrogen, oxygen, and carbon. Then they take up the bits and use them to make more turkey tail mushrooms. Eventually the turkey tail dies, and its molecules become available for other living things.

#### THE ROTTEN TRUTH:

Turkey tail mushrooms make compounds that make people's immune systems stronger. Scientists are studying whether these compounds could be used to help fight cancer.



BRITISH SOLDIER LICHEN BY BILL JOHNSON

SCARLET CUP FUNGUS BY BILL JOHNSON

BIRD'S NEST FUNGUS BY BILL JOHNSON

Lichens (partnerships of fungi and algae) and fungi (including molds, mildews, rusts, mushrooms) can recycle dead wood because they contain enzymes capable of degrading the chemical bonds in cellulose.

STREPTOMYCES, C DENNIS KUNKEL MICROSCOPY, INC. ASSOCIATES



#### THE ROTTEN TRUTH:

*Streptomyces* is a major source of antibiotic medicines, which fight infections caused by other bacteria.

### SOIL BACTERIA (*Streptomyces species*)

The fresh fragrance of moist soil is due to a bacterium known as *Streptomyces*. The earthy smell comes from a compound called *geosmin*. *Streptomyces* bacteria are too small to see without a micro-

scope. They live in the soil. They find big molecules in dead leaf bits and animal droppings and break them down into little molecules, which other animals can use to build their bodies. **V**

### Rot-a-thon

For some summer fun, have a rot-a-thon with some friends. Ask your grownups for overripe or bruised fruit to set outdoors where you think lots of recyclers will be able to reach it. (Find a place pets can't reach, or they may recycle it all at once for you.) Check your fruit regularly for nibble

marks from mice, ants, flies, or wasps, and for growth of different kinds of mold or bacteria. Race with your rot-a-thoner friends to see who finds the biggest variety of nature's recyclers. *Something to think about: For best results, should your fruit be in the sun, the shade, or both? Why?*

### A NOTE TO TEACHERS

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