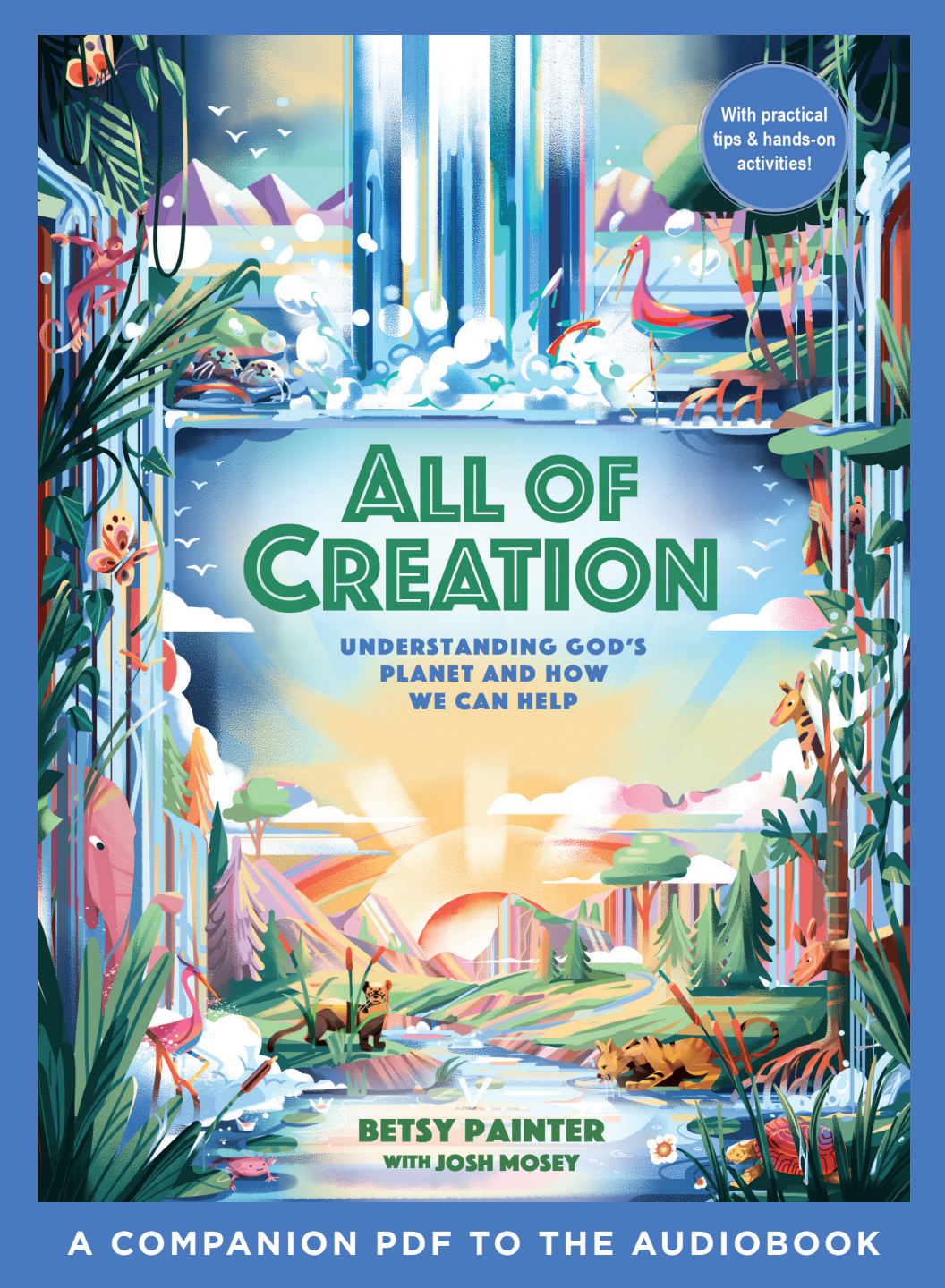




With practical
tips & hands-on
activities!

ALL OF CREATION

UNDERSTANDING GOD'S
PLANET AND HOW
WE CAN HELP

BETSY PAINTER
WITH JOSH MOSEY

A COMPANION PDF TO THE AUDIOBOOK

ZONDERKIDZ

All of Creation

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ISBN 978-0-310-14343-7 (hardcover)

ISBN 978-0-310-14350-5 (audiobook)

ISBN 978-0-310-14349-9 (ebook)

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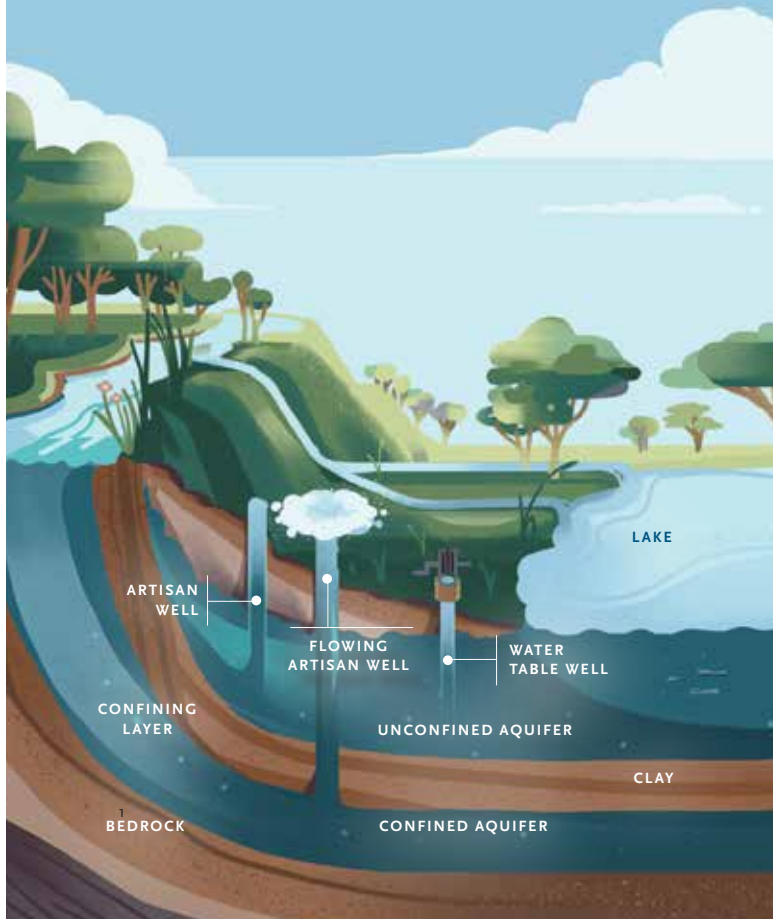
Cover design: Cindy Davis

Interior design: Denise Froehlich

Printed in China



Aquifers and Wells



An aquifer is an underground layer of rock that acts like a sponge. Humans rely on aquifers for drinking water. These stony sponges allow water to move up through the saturated rock and sediment, providing about 37 percent of our drinking water!

DO THE WATER POLLUTION CLEANUP EXPERIMENT AT HOME

Supplies

- 💧 4 clear containers, such as plastic cups or glass jars
- 💧 Dirt/soil
- 💧 Food coloring
- 💧 Candy wrappers, bits of plastic, and other trash
- 💧 Coffee grounds, tomato sauce, or other food scraps
- 💧 1 mesh strainer
- 💧 2 coffee filters
- 💧 3 sheets of paper towel
- 💧 1 spoon
- 💧 1 tray (for the things you'll scoop out of the water)

Directions

1. Fill two of the containers about half full of clean water.
2. Observe how they look and smell.
3. Add some dirt/soil, food coloring, and food scraps to the water in one of the containers. Stir it around with the spoon.
4. Make more observations. How does that container look and smell now?
5. Begin cleaning up the container, using the spoon to remove whatever you can from the polluted water.
6. Next, use the mesh strainer to clean up your polluted water by pouring the dirty water into one of the empty containers.
7. Make an observation. How effective was the strainer at cleaning the water? How does the water look and smell now?

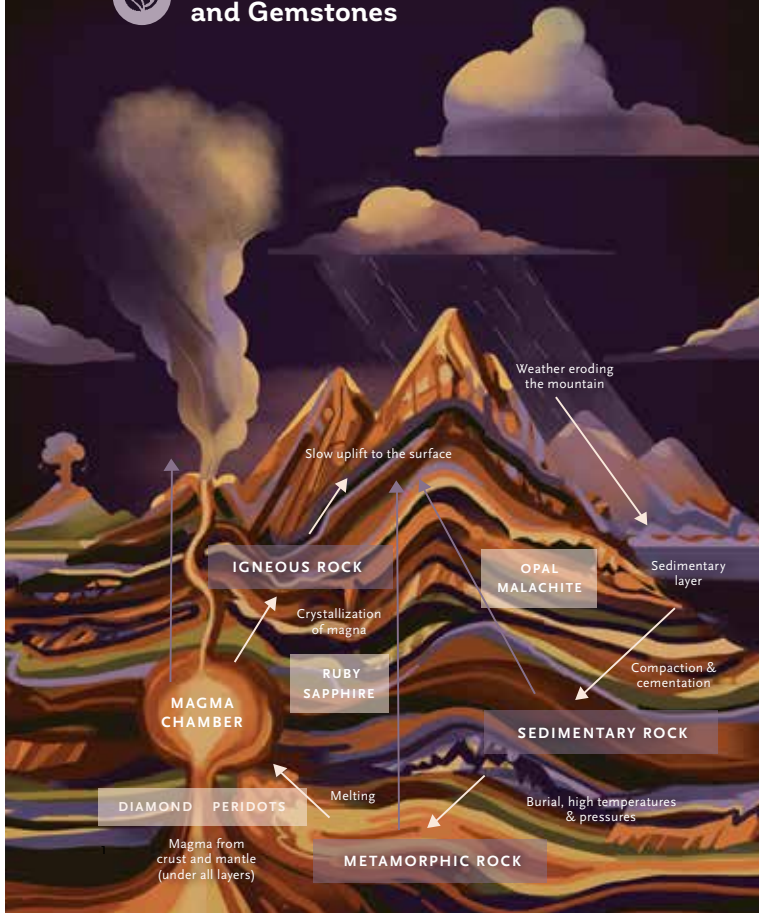
8. Now pour the polluted water through the coffee filters into the remaining empty container.
9. Make an observation. How effective were the coffee filters at removing the pollution from the water?
10. Compare the container that had none of the dirty bits added to the one you've spent time cleaning up. Can you tell them apart?

Reflection Questions

- 💧 Compare the water levels between the final two containers. Which one has more?
- 💧 Would you want to drink the water that's been cleaned up? Why or why not?
- 💧 Which bits of pollution were the easiest to remove? Which ones were the hardest?
- 💧 What do you think might happen if you added other pollutants like vegetable oil or juice to the water before attempting to clean it up? Feel free to try the experiment again to see what happens. Just make sure you use the paper towels to clean up any mess you made!



The Formation of Minerals and Gemstones



If there was a highway to the earth's core (and you were traveling at normal highway speeds), it would take less than twenty minutes to get through the earth's crust. To reach the bottom of a tectonic plate, you'd have to travel for about an hour. But to get to the very center of the earth, it would take around sixty-six hours (two full days plus eighteen more hours) of driving, not counting bathroom breaks.

Make a Crayon Lava Flow at Home

Supplies

- 💧 Old crayons
- 💧 Aluminum foil
- 💧 A frying pan
- 💧 Oven mitts

Directions

1. Peel the paper off your old crayons.
2. Break up the crayons into smaller bits.
3. Line the frying pan with aluminum foil. (No one wants melted crayon all over their nice frying pan.)
4. Place the crayon bits into the frying pan.
5. Make an observation. What shape are the crayon bits before the experiment begins?
6. Have an adult heat the frying pan over medium heat until the crayons begin to melt.
7. Using the oven mitts, carefully tilt the pan to create a lava flow.
8. Remove the pan from the heat. Turn off the stove. Let everything cool completely. Don't touch the melted crayon!
9. Make an observation. How did the crayon change when heat was applied?

Reflection Questions

- 💧 How might cooling the crayon quickly in ice water change its appearance compared to allowing it to cool slowly?
- 💧 What would happen if you used more than one color crayon prior to melting?
- 💧 How could you simulate how sedimentary rocks are made using crayon shavings?
- 💧 How are melted crayons similar to rocks and minerals in the earth's mantle?



The carbon cycle goes like this: carbon moves from the air to plants (in photosynthesis), from plants to animals, from plants and animals to soil (through decomposition), from living things and fossil fuels to the atmosphere, and from the atmosphere to the ocean.



Global Food Production and Waste

\$1 TRILLION DOLLARS' WORTH OF FOOD IS LOST OR WASTED EVERY YEAR.

IF EVEN 25% OF THE FOOD CURRENTLY LOST OR WASTED COULD BE SAVED, IT COULD EASILY FEED 870 MILLION HUNGRY PEOPLE IN THE WORLD.



UNITED STATES

In the United States alone, \$48.3 billion is thrown away each year. Overall losses are \$90–100 billion per year.



EUROPE

The food currently wasted in Europe—about 6.7 million tonnes—could feed 200 million people.



ASIA

In Asia, around 23 million tonnes of food cereals, 12 million tonnes of fruits, and 21 million tonnes of vegetables are lost each year.



LATIN AMERICA

In Latin America the food lost or wasted could feed 300 million people.



AFRICA

In Africa, losses can reach up to 50% for some less hardy crops, such as fruits, vegetables, and root crops.



INDIA

An estimated 580 billion rupees (nearly \$8 billion) is wasted each year in India, in agricultural produce.



AUSTRALIA

In Australia, an estimated \$10.5 billion was spent on items thrown away (more than \$5,000 per capita per year).





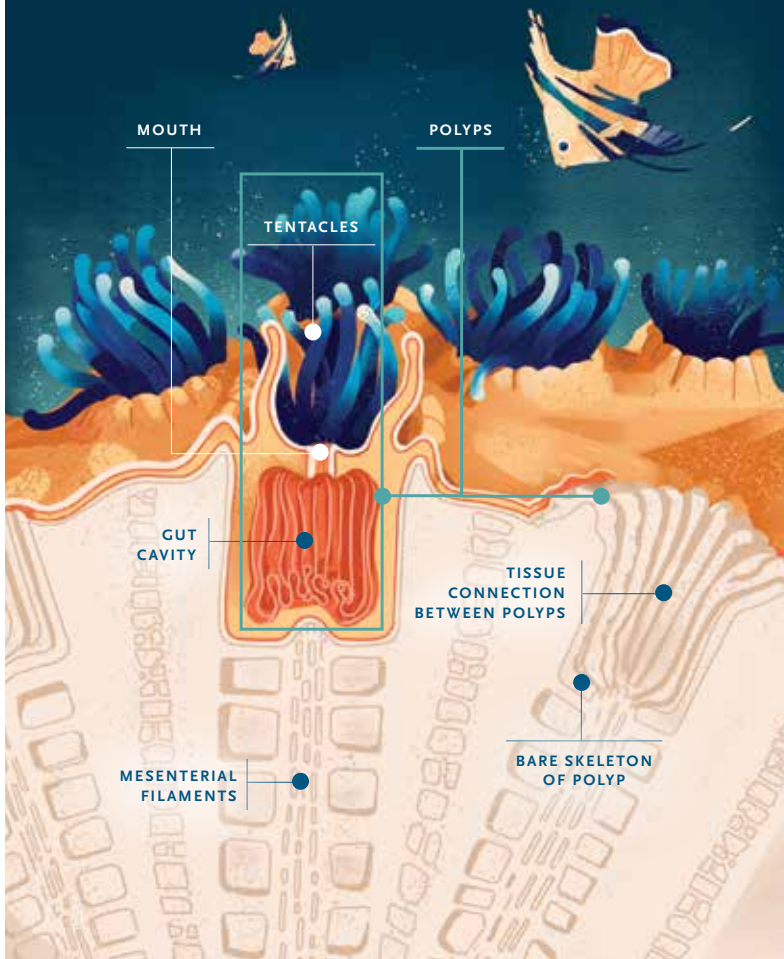
The Mangrove Ecosystem



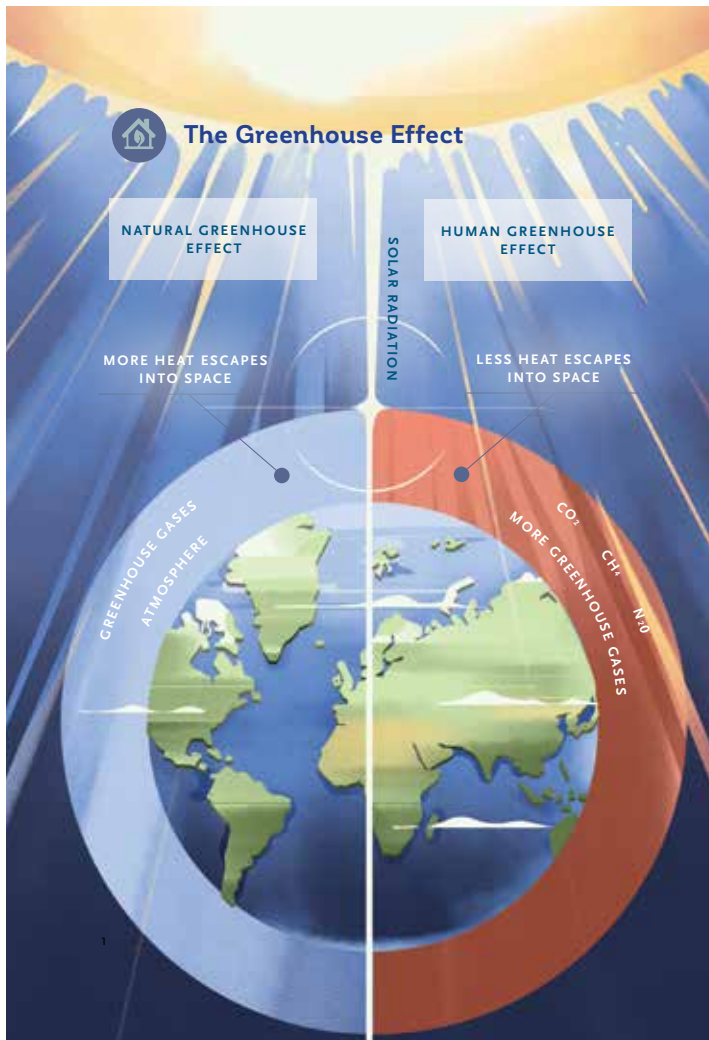
Mangroves provide homes for thousands of species, prevent erosion, filter pollution, and protect the land from waves and storms. They filter up to 90 percent of salt from seawater. The destruction of mangroves in wetlands leads to coastal damage and increased flooding, along with the release of large amounts of carbon dioxide into the atmosphere.



Anatomy of a Reef



The coral reef is made of thousands of polyps. This illustration shows the basic anatomy of a single polyp—the main part affected by coral bleaching. Bleaching happens when corals get rid of the algae that live inside their tissue, causing them to fade, often turning completely white.



The greenhouse effect is the natural warming of the earth's surface and atmosphere that results from the presence of carbon dioxide, methane, water vapor, and other gases or aerosols. Like a greenhouse, this radiating heat gets trapped in our atmosphere because certain gases allow sunlight to enter while blocking the heat from escaping. Humans have added to this greenhouse effect and messed with the natural level of greenhouse gases in the atmosphere.

GLOSSARY

Air Pollution: When the mix of life-sustaining gases gets messed up or mixed with toxic elements. This is terrible for ecosystems and human health.

Aquifer: An underground layer of porous (hole-filled) rock that acts like a sponge, allowing water in the ground to move up through saturated rock and sediment.

Bioaccumulation: When toxic chemicals build up in living organisms.

Biodiversity: Refers to the great variety of life on earth, and describes the number of different species (plant, animal, and fungus) in a community, ecosystem, or biome.

Brackish: A mix of fresh and salty water.

Clean Air Act (CAA): A group of laws passed in 1970 that allowed the US government to regulate air pollution emissions from sources like vehicles, power plants, and factories. It also addressed chemical pollutants that are damaging the atmosphere's ozone layer, and it aimed to reduce acid rain and improve air quality and visibility.

Clean Water Act (CWA): A group of laws passed in 1972 that made it unlawful to dump pollutants into rivers, streams, and other bodies of water without a permit. The CWA also regulates quality standards for surface waters.

Confined animal feeding operations (CAFO): An industrial agricultural practice where livestock animals (like cows, pigs, and chickens) live in cramped conditions. These animals are especially susceptible to the spread of disease.

Decaying material: Anything that is decomposing and adding good material and nutrients back into the soil, such as rotting fruits and vegetables or animals who have died.

Deforestation: When forests disappear because we don't replant trees fast enough to replace them.

Ecosystem: An interconnected community made up of living things (animals and organisms) and their non-living environment, working together as a unit. Different areas of the planet have completely different kinds of ecosystems.

Endangered Species Act (ESA): A group of laws passed in 1973 that protects threatened species and their habitats by requiring development projects to get permits when the project may impact an endangered species. The ESA also stops people from hunting at-risk species. This group of laws has an impressive success rate—99 percent of species protected under it have avoided extinction! It's brought back many species from the brink of extinction, including the bald eagle, peregrine falcon, gray wolf, and grizzly bear.

Estuary: A partially enclosed body of water where a river meets the sea, creating a mixture of fresh and salt water.

Fen: a type of wetland that is made of low land that's either completely or partly covered with water. The soil is peaty—which means it's wet, spongy, and filled with decaying plants—and there are often reeds and similar plants growing in the area.

Food chain: One animal eats another, then another animal eats that one, and so on. Humans tend to be at the top of the food chain because we eat so many plants and animals.

Food web: Like a food chain, but it recognizes that even when animals aren't eating each other directly, they can impact the diets of other animals. Humans don't eat bees, but we do eat the honey that bees make, so we're connected via the food web.

Haecceity: The “thisness” of any one thing. It's what makes your favorite stuffed animal different from every other similar stuffed animal.

Industrial agriculture: Farms that are owned and worked by big companies instead of by small families. These big companies use technology to grow the most food per square foot possible and often only grow one type of crop instead of lots of different ones.

Invasive species: Plants and animals that are plopped into an ecosystem from somewhere else, often by humans, and harm the plants and animals that were there first.

Light pollution: Artificial (man-made) light that blocks our view of the night sky. It can change our sleeping habits, trick animals into hibernating and eating at the wrong times, and mess with bird migrations.

Megafauna: Big animals from around the world, like rhinoceroses, elephants, pandas, and leopards.

Minimalism: Only buying the things you need.

Monsoon: A seasonal change in the direction of a region's strongest winds. They always blow from cold to warm regions. When the winds are moving from land to the ocean, the weather in a region is extremely dry. When the winds blow from the ocean to the land, the region has heavy rainfall.

Mountaintop removal: Blowing up mountaintops to get to the rocks buried underneath. This method is mainly used to mine coal. It doesn't only destroy the beauty of the mountains; millions of tons of rock, sand, and coal debris (tiny bits) from the explosions are dumped in the valleys and end up polluting waterways and the atmosphere. This mining practice has caused a lot of arguments in the central Appalachian Mountains, where communities near the mines suffer from an increase in heart diseases, lung cancer, and birth defects.

Overexploitation: When people hunt and harvest wildlife faster than the population of that wildlife can reproduce.

Overfishing: When people take so many of one kind of fish out of a body of water that it throws off the balance of the ecosystem.

Particulate matter: A mixture of solid particles and air droplets light enough to float in the air. This includes dust, pollen, soot, or smoke, but the more troubling varieties are made up of chemicals from power plants and automobiles.

Photosynthesis: The process in which plants and other organisms capture carbon dioxide and sunlight to produce oxygen and chemical energy in the form of sugar (plant food!).

Plogging: Picking up litter as you go for a run. The word is a mashup of the Swedish words *plocka upp* (which means “pick up”) and *jogga* (which means “jog”).

Pollinator: Anything that helps carry pollen from one part of a flower, bush, or tree to another to allow that plant to produce fruits, seeds, and young plants.

Reservoir: A place to keep water for when you need it.

Soil erosion: When soil washes away or turns into plain old dirt due to a lack of nutrients.

Symbiotic relationship: When two different things work together in ways that help them both.

Tectonic plates: Different sections of the earth's crust and upper mantle that float on top of the liquid magma (melted rock) near the earth's core.

Upcycle: Creatively reusing the things you no longer need in order to give them a new life as something else.

Zoonotic: The kind of disease that can jump from animals living in the wild to animals on farms to people. A few examples of zoonotic diseases include Ebola, West Nile virus, and Lyme disease.