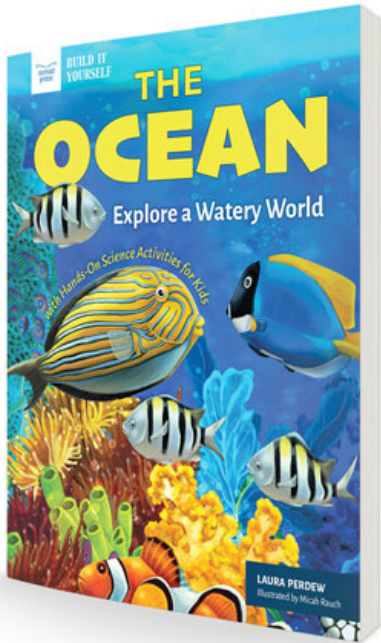


Nomad Press

CLASSROOM GUIDE



What does the ocean do?

The mighty ocean covers 70 percent of the planet, supports more than 100,000 marine species, regulates climate, feeds billions of people, and plays a key role in the carbon cycle.

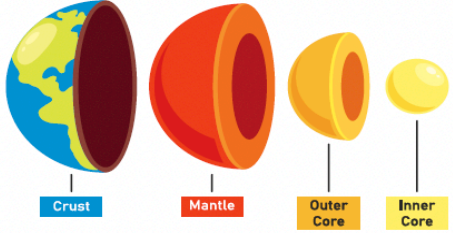
In *The Ocean: Explore a Watery World with Hands-On Science Activities for Kids*, young marine biologists learn the ocean's history and the key roles it plays on Earth, including its part in the carbon cycle and in regulating weather and climate. Explore the polar oceans, intertidal zones, the shallow ocean, the deep open ocean, and the incredible biodiversity adapted to living there.

Learn more at nomadpress.net/nomadpress-books/the-ocean

Softcover: 9781647411510, \$19.95
Hardcover: 9781647411480, \$24.95
eBook: all formats available, \$12.99
Specs: 8 x 10, 128 pages, color interior

Reading Level: Ages 9–12
Interest Level: Grades 4–6
Focus: Earth Science
GRL: V Lexile: TBD



THE OCEAN	MEET EARTH'S OCEANS
<p>WORDS TO KNOW</p> <p>molten: made liquid by heat. water vapor: the gas form of water in the air. condense: the process by which a gas cools and becomes a liquid. mineral: a naturally occurring solid found in rocks and in the ground, such as gold, salt, and copper. erode: to wear away. basin: a depression in Earth's crust that holds water. comet: a ball of ice and dust that orbits the sun. continent: one of the earth's large landmasses, including Africa, Antarctica, Australia, North America, South America, and Asia and Europe (called Eurasia). geology: the study of the physical features of Earth, including its layers. dense: packed tightly together. inner core: the innermost layer of Earth, made of super-hot solid metal. outer core: a spinning mix of liquid nickel and iron surrounding Earth's inner core. mantle: the middle layer of Earth. crust: the earth's outer layer. basalt: a black, shiny volcanic rock. granite: a type of rock that contains many crystals. It is formed underground during a long period of time with an enormous amount of pressure. salinity: the measure of dissolved salts in water.</p> <p>THE OCEAN'S BEGINNINGS</p> <p>The way the ocean looks now is very different from how it used to look. In fact, when Earth formed more than 4.5 billion years ago, there was no ocean at all—the planet was way too hot. It was so hot that the rocks were molten, glowing liquid. As millions of years passed, though, the planet cooled enough for water vapor to condense. That allowed water to gather and oceans to form.</p> <p>We are lucky to have that water on Earth—we wouldn't be here without it! But scientists are still not completely certain where that first water vapor came from.</p> <p>One theory is that the water was already here when Earth formed. According to that theory, as the molten rock cooled, it released water vapor, which condensed into rain and eventually filled basins that became our oceans. Another theory suggests that icy comets struck our planet when it was young, bringing us water. The reality is that our water may have come from multiple sources and scientists are still investigating.</p> <p>The ocean is salty because of dissolved minerals that originated on land. During millions of years, rain erodes rocks on land and washes the minerals out to sea, where they accumulate.</p>	<p>No matter the source, water accumulated on Earth and the ocean formed about 3.8 billion years ago. Earth used to be one, huge shallow ocean covering the whole planet—there were no continents.</p> <p>Here we must pause for a short geology lesson. Yes, this is a book about the ocean, not rocks. But in order to understand our ocean's past and present, we need to understand what Earth is made of.</p>  <p>Let's start with the four layers of Earth. As the planet formed, layers of lighter and heavier rock separated. The denser, heavier rock—made of iron and nickel—sunk deep toward the center of Earth to make up the solid inner core. The outer core is also made of iron and nickel but in liquid form. The next layer is the mantle, made of iron, magnesium, and silicon. This layer is also liquid but thicker than the outer core. Finally, the lighter rock formed the crust, the thinnest layer.</p> <p>The crust is made of two kinds of rock, basalt and granite. Basalt is denser than granite. Gradually, these lighter and heavier rocks in the crust also separated into layers.</p> <p>Learn more about ocean salinity from this Woods Hole Oceanographic Institution video. Where on Earth are the oceans the least salty? <small>© Woods Hole, salty</small></p>

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ESSENTIAL QUESTIONS

BEFORE READING:

Establish Background Knowledge

- What are some facts you already know about the ocean?
- What are some of the ways organisms that live in the ocean are different from those that live on land?
- Do you live near the ocean or have you been near an ocean? What did it smell like? Feel like?

Skill Introduction

- What do you do when you come to a word or phrase you do not know?
- How do illustrations, photographs, and videos help some people learn?
- How do hands-on activities help people learn?

CCSS.ELA-Literacy.L.5.c Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.

CCSS.ELA-Literacy.RI.5.6 Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.

CCSS.ELA-Literacy.SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

DURING READING:

Check for Understanding

- What are the steps in the scientific method?
- What do you do when an activity or experiment doesn't work like you want it to?
- What are some careers that involve the ocean?

CCSS.ELA-Literacy.W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

CCSS.ELA-Literacy.SL.c Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

AFTER READING:

Summary and Expansion

- What are the zones of the ocean? How are they different?
- What are some of the organisms that make up the base of the maine food web? Why are these vital to all life in the ocean?
- What makes ocean exploration complicated?
- How do ocean currents help regulate the climate?
- How have some organisms adapted to life in the polar regions?
- What dangers do coastal regions face as the planet warms?
- How do coral reefs protect many marine species?
- How do the different ocean zones support marine life?
- Why are hydrothermal vents important to the marine ecosystem?
- Why do you think humans as a species are motivated to explore? What might it have been like for the first people to embark across the unknown ocean?
- How is the ocean essential for global trade?
- In what ways do we rely on the ocean?
- In what ways is the ocean in danger?
- What can people do to help improve the ocean's health, both as individuals and in groups?

CCSS.ELA-Literacy.L.5. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships (e.g., however, although, nevertheless, similarly, moreover, in addition).

CCSS.ELA-Literacy.RI.5.2 Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

CCSS.ELA-Literacy.SL.5.1d Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

CCSS.ELA-Literacy.W.5.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

THE OCEAN IS SALTY!

One of the ocean's best-known characteristics is that it is salty. The ocean's salinity affects both the water's **density** as well as the temperature at which it freezes. See for yourself!

- **Start by making salt water: In the measuring cup, dissolve 3 tablespoons of salt in 1 cup of water.** Stir to combine. Pour the salt water into one of the plastic cups until the cup is about three-quarters full. Fill a different plastic cup with the same amount of fresh water.
- **Predict whether you think a plastic jewel will float in the fresh water (Note: if you don't have plastic jewels, try using a small grape or a raw egg in its shell).** Place it in the water.
- **Do you think the object will float in the salt water?** Place it in the salt water. Record your observations.
- **Remove the objects from the cups and put both in the freezer.** For the first two to three hours, check the cups every half hour. Observe and record what you see. Did the salt water or the fresh water freeze first? What happened after 24 hours?
- **Next, make a new batch of salt water, dissolving 3 tablespoons of salt in 1 cup of water in the measuring cup.** Stir to combine. Pour the salt water into one of the plastic cups until the cup is about one-half full. Fill a second cup half full of fresh water. Add several drops of food coloring to the fresh water and stir to combine.
- **Add the colored water to the salt water, pouring down the edge of the cup.** What happens? Do the solutions mix? Which solution is denser?



TEXT TO WORLD

Have you been near the ocean? What did it look like? Smell like? Feel like?

IDEAS FOR SUPPLIES

- measuring cup
- salt
- measuring spoons
- fresh water
- spoon
- 4 plastic cups the same size (6 oz or larger)
- small plastic jewels
- food coloring

Try This

Repeat the experiments using sugar in one cup (3 tablespoons dissolved in 1 cup water) and baking soda in another (3 tablespoons dissolved in 1 cup water). Predict what will happen. What do your results tell you about these substances?

WORDS TO KNOW

density: a measure of how closely packed items are.

Check out more titles and other great activities at nomadpress.net.

MODELING

OCEAN CURRENTS

One of the ocean's best-known characteristics is that it is salty. The ocean's salinity affects both the water's density as well as the temperature at which it freezes. See for yourself!

CAUTION: Ask an adult to help with the boiling water.

- **In the bottom of the baking dish, use the clay to create landmasses and seafloor features such as ridges, volcanoes, and trenches.** Let the clay dry completely.
- **Fill your baking dish with water.** Add blue food coloring to create your own ocean. Using a straw or hair dryer, blow on the surface of your ocean to simulate wind and create a surface current. How do the landmasses and seafloor topography affect the current? Create wind of different strengths and make it flow from different directions. Record your observations.
- **Add 2 cups of ice to your ocean.** Let the ice melt for a few minutes to cool the water. While you wait, boil 2 cups of water. Add red food coloring to the hot water and carefully pour it into the corner of your ocean. What happens? Add wind and observe again.
- **What currents do you see?** How does the land and underwater topography affect the currents? What surprised you about the currents that formed? Add plastic animals and observe how they move with currents.

IDEAS FOR SUPPLIES

- large, deep, clear baking dish
- clay
- water
- red and blue food coloring
- straws or a hair dryer
- ice cubes
- plastic toy ocean animals (optional)
- science notebook

Try This

Draw a map of your ocean and landmasses. Choose a wind pattern and draw the ocean current on your map. Show how the coastline and seafloor features affect the current. Name your ocean and the landmasses. Add a title, **compass rose**, and map key to your map.



TEXT TO WORLD

Have you been near the ocean? What did it look like? Smell like? Feel like?

26

WORDS TO KNOW

compass rose: a circle drawn on a map to show north, south, east, and west.

Check out more titles and other great activities at nomadpress.net.

OIL SPILL CLEANUP

Drilling for oil beneath the ocean floor and shipping by ocean comes at a cost—sometimes oil spills or leaks into the ocean. These spills put the ocean ecosystem at risk and harm wildlife and plants. Cleaning up oil spills is a challenging task. Try this experiment to remove oil from water.

➤ **Fill your tray with water, about ½ to 1 inch deep.** Pour a few tablespoons of oil into the water.

➤ **Skim the water's surface with each of the different absorbent materials.** Which ones remove the oil most effectively? Do some materials pick up just the oil, while others pick up both water and oil?

➤ **Try removing the oil with a spoon or syringe.** How effective is that compared to using absorbent materials?

➤ **Try building something in the water to contain the oil.** This could be a wall of rocks, or perhaps a floating boom around your “oil spill” to keep it from spreading. What works best? Record your results in your science journal.

IDEAS FOR SUPPLIES

- tray for water
- water
- vegetable oil
- spoon
- cotton balls or squares
- sponge
- paper towel
- syringe
- science notebook

Watch this TED-Ed video about noise pollution in the ocean. How is noise pollution affecting reef fish, dolphins, right whales, and zooplankton?

▶ TED-Ed ocean louder



Try This

Oil spills harm birds. The oil sticks to their feathers, makes them heavy, and prevents the birds from flying. One method to help birds and other animals is to give them a gentle bath in Dawn dish soap. This product is known for removing grease and oil not only from dishes but also from animals. Try putting a few drops of Dawn in your tray. What happens? If you have a bird feather, soak it in oil and observe the feather. Then wash it with Dawn. How effective is the soap in removing the oil?

Check out more titles and other great activities at nomadpress.net.

OCEAN POETRY

You have learned a lot about the ocean, its roles on the planet, and its amazing biodiversity. You've also learned how people rely on and impact the ocean and how they are working to protect it. Use what you've learned to write a collection of poems about the ocean.

➤ **Research different types of poems: free verse, haiku, ode, cinquain, limerick, acrostic, diamante, shape poem, and more.** When you write the poems, try to use a different form each time.

➤ **Pick a theme for your poems.** Conservation? Creatures of the deep ocean? A particular ocean ecosystem such as a coral reef? The theme will be the thread that connects the poems.

➤ **Spend time brainstorming, drafting, and revising five poems.** Use a different form for each one. Have a friend, family member, or teacher give you feedback and revise. When the poems are ready to publish, write each one out on a piece of white paper and then illustrate it. Bind the collection with staples, yarn, or a spiral bind.

IDEAS FOR SUPPLIES

- science notebook
- blank white paper
- colored pencils or markers

Want to learn about different types of poetry? Try this website!



🔍 Pobble poetry types

Try This

Instead of five poems, write ten or have friends or family members each contribute a poem about the ocean to create an anthology. If poetry isn't your thing, perhaps make an ABC book of the ocean or write mini essays related to your theme.



TEXT TO WORLD

What can you do today to help oceans stay healthy?

Check out more titles and other great activities at nomadpress.net.

SAMPLE GLOSSARY

acoustics: the way sound carries within a space.

adaptation: the changes a plant or animal makes to help it survive in its environment.

aerate: to create channels that allow air to flow through.

algae: plant-like organisms that turn light into energy but do not have leaves or roots.

algal bloom: a rapid increase in the growth of algae in a body of water.

anemone: an animal without a backbone that is related to corals and jellyfish.

Antarctic Circumpolar Current (ACC): an ocean current that flows from west to east around Antarctica.

Antarctic Convergence: the place where the colder, denser, saltier water of the Southern Ocean meets the warmer, less-dense waters to its north.

antifreeze: a liquid that is added to a second liquid to lower the temperature at which the second liquid freezes.

aquaculturist: a person who farms plants and animals in water.

atmosphere: the blanket of gases around the earth.

baleen: the tough, flexible material hanging down in some whales' mouths to help trap their food.

basalt: a black, shiny volcanic rock.

basin: a depression in Earth's crust that holds water.

bathysphere: a spherical, manned submersible made of steel that is suspended from a ship for deep-ocean exploration.

bay: a body of water surrounded by land on three sides.

bedrock: hard, solid rock below the soil.

biodiversity: the variety of life on Earth.

biological carbon pump: the process by which carbon is moved from the surface of the ocean to the deep ocean, where the carbon is stored for long periods of time.

bioluminescence: the production and emission of light from a living organism.

bivalve mollusk: a marine animal with a soft body protected by two shells hinged together.

blubber: a thick layer of fat under the skin of some animals that prevents heat loss and stores energy.

blue carbon: carbon stored by the ocean.

brackish: somewhat salty, as in the mix of fresh water and sea water found where rivers meet the ocean.

bycatch: marine species caught accidentally as people fish for other species.

calcium carbonate: a naturally occurring compound consisting of calcium, carbon, and oxygen.

AUTHOR INTERVIEW



WHAT WAS YOUR FAVORITE PART ABOUT WRITING THIS BOOK?

That's easy—while sitting in my land-locked state of Colorado, I got to explore the ocean! And while I knew a lot about the ocean, I still learned so much while doing the research and I was

continually amazed about the things I discovered.

WHAT DO YOU HOPE READERS WILL TAKE AWAY FROM THIS BOOK?

I hope that readers will remember the critical roles the ocean plays on our planet, and be amazed by its biodiversity. With that knowledge, readers will understand the urgent need to conserve and protect the ocean, and hopefully be inspired to take action.

WHY DID YOU WANT TO WRITE A BOOK ABOUT THE OCEAN?

Because I love it. One of the best things about being an author is submitting proposals for topics I'm personally interested in. That allows me to explore my passions

and to learn. Researching and writing about the ocean gave me a deeper understanding and appreciation for it. Not only did I learn more about the ocean itself, I discovered all kinds of amazing species I never knew existed...strawberry squid, egg-yolk jellyfish, mangrove tree crabs, salt marsh grasshoppers, rhodoliths, cockatoo squid, flashlight fish, and so many more!

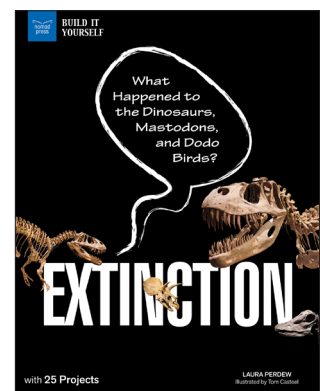
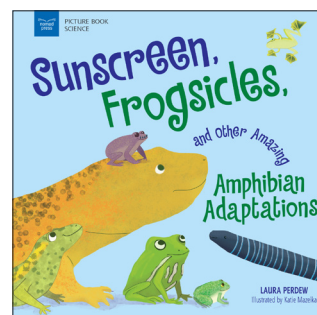
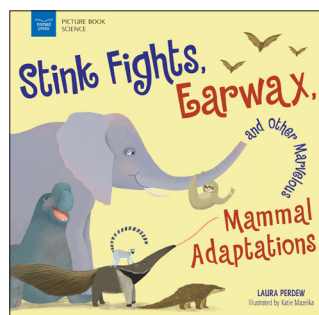
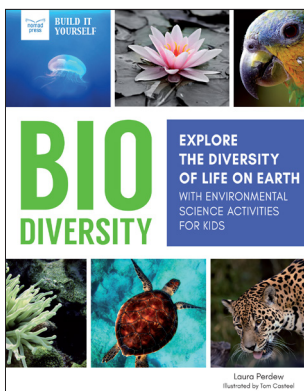
WHAT SURPRISED YOU THE MOST DURING YOUR RESEARCH?

There are too many things to name. One thing that stands out is that even though the ocean covers more than 70 percents of the planet, only 5 percent has been explored. Only 5 percent! Just think about how much we don't know and how many species are yet to be discovered!

WHY INCLUDE HANDS-ON ACTIVITIES IN YOUR BOOK?

When I was a teacher, hands-on and interactive activities were always a part of my lessons. They allow students opportunities to interact with material and to think more deeply about a subject. The book's activities do the same – they invite readers to engage with the topic in a whole new way and encourage them to reflect on what they've learned. I also try to vary the activities so they are not only cross-curricular, but so they meet the needs of diverse learners.

More books from Laura Perdeu and Nomad Press



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AUTHOR INTERVIEW

WHAT'S YOUR FAVORITE PART ABOUT BEING A CHILDREN'S BOOK AUTHOR? One of the best things about children is their natural curiosity and wonder. It's also one of the best things about being a children's book author – I have think like a kid and wonder about things that interest them.

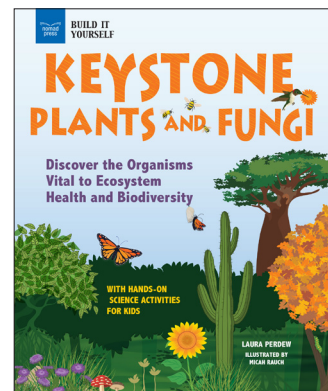
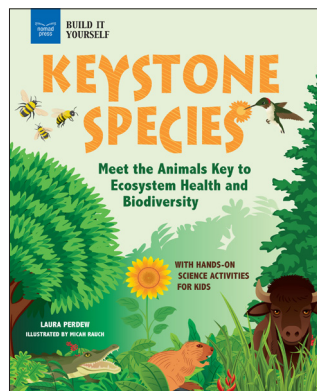
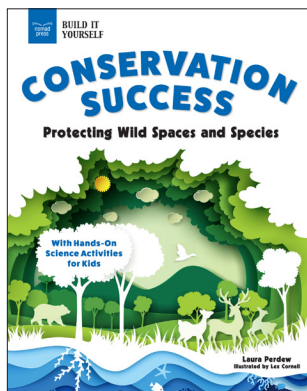
Plus, I learn so much as I research – sometimes it's difficult to decide what to put in a book and what to leave out. Most importantly, though, being a children's book author is an opportunity for me to share things about the natural world that amaze me, with the hope that I am inspiring young readers to help take care of our planet and all of its incredible species.

WHAT OTHER TOPICS HAVE YOU WRITTEN ABOUT? A lot! I've been lucky to get assignments on a wide variety of topics – keystone species, conservation, animal adaptations, the history of art, animal rights, the local food movement, biomes, the history of toilets, and more. In the past few years, I've focused my writing exclusively on the nature, the environment, and sustainability because that's where my passion lies.

DO YOU DO SCHOOL VISITS? I do! I love being in schools and classrooms – I get to connect with kids and share my passion for the natural world. I do in-person visits as well as virtual visits. Not only do I have presentations based on my different books, I also offer workshops on reading and writing nonfiction.

WHAT DO YOU DO IN YOUR FREE TIME? I spend as much time outdoors as possible. I love to run, hike, camp, and explore. In the summer my absolute favorite thing is to hike to high alpine lakes surrounded by jagged peaks and fields of wildflowers. Colorado is an especially great place to live and play, but I do love the ocean too and visit as often as possible!

More books from Laura Perdeu and Nomad Press

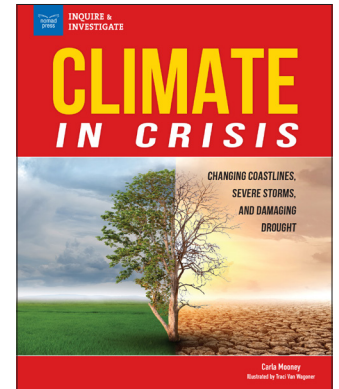
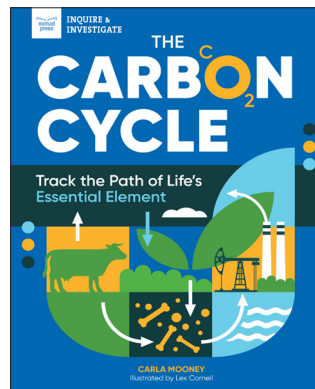
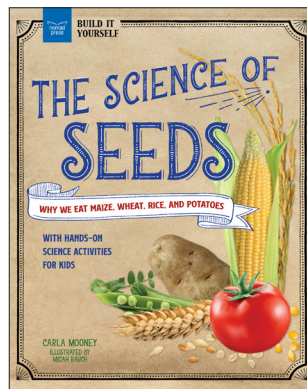
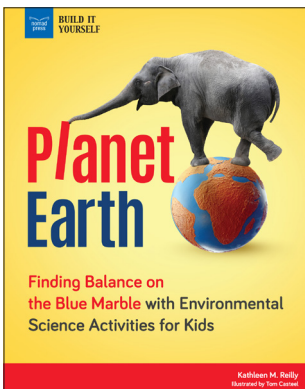
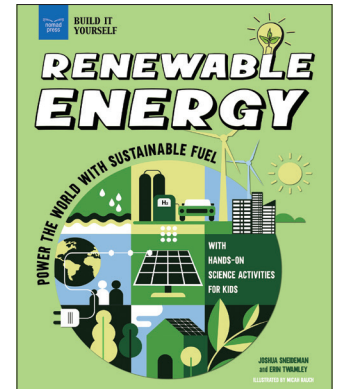
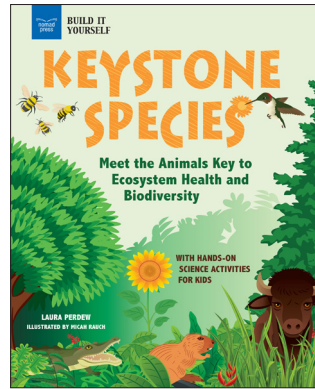
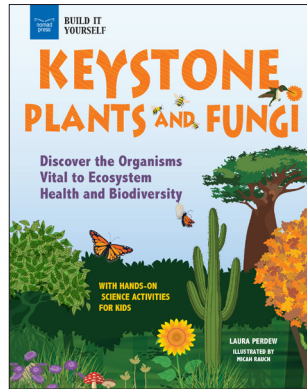
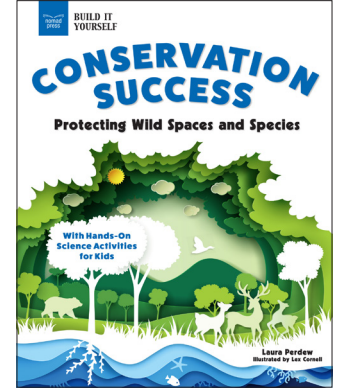
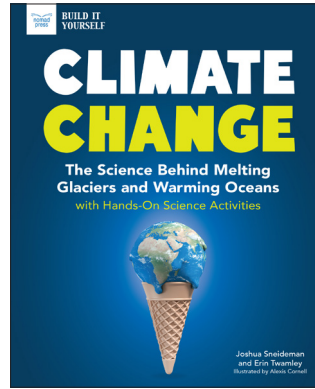
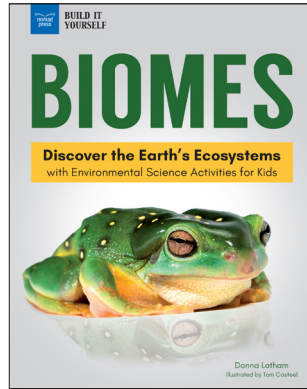
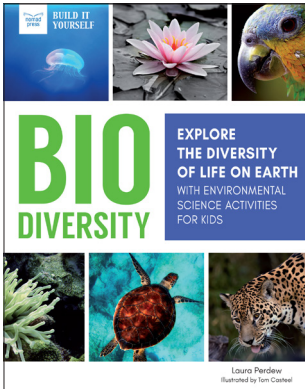


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