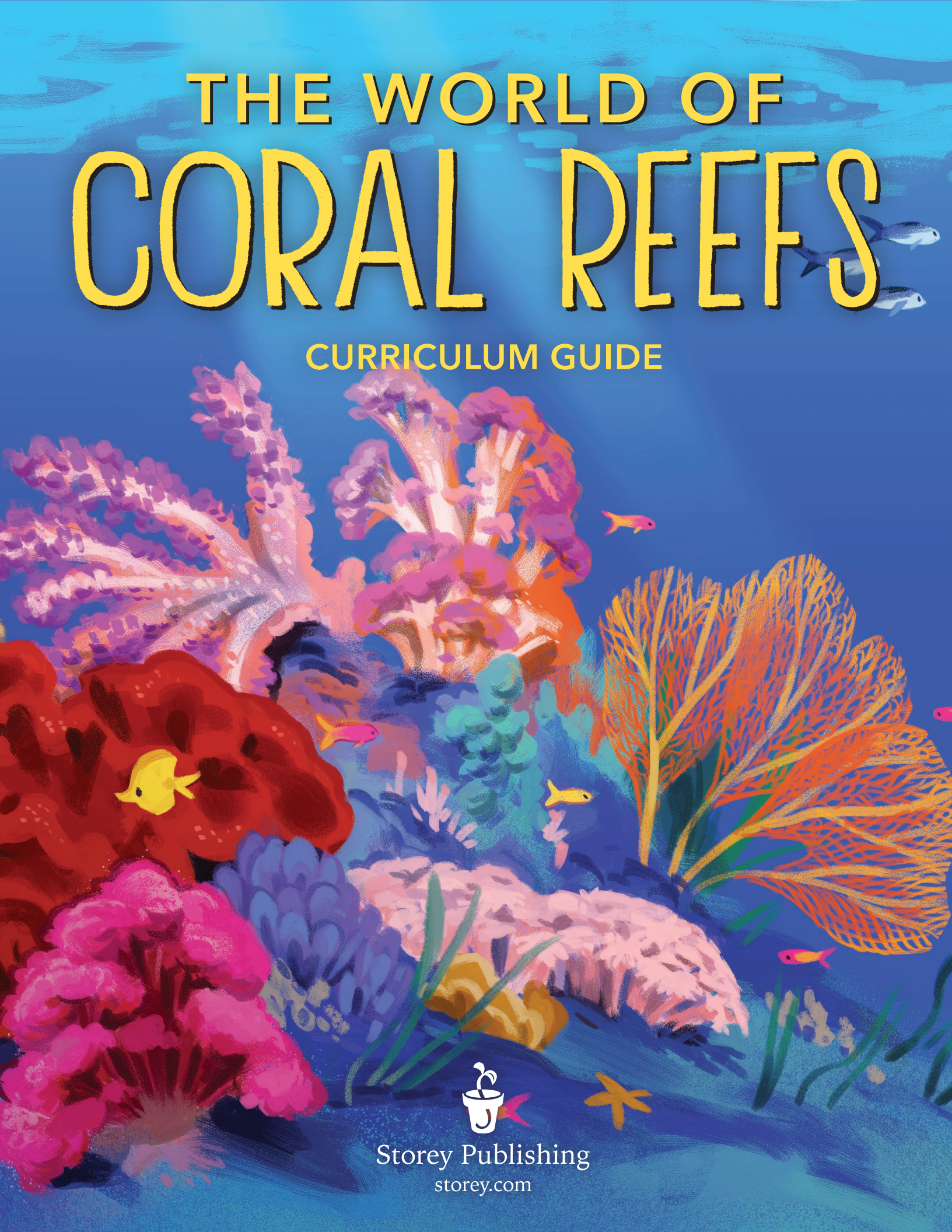
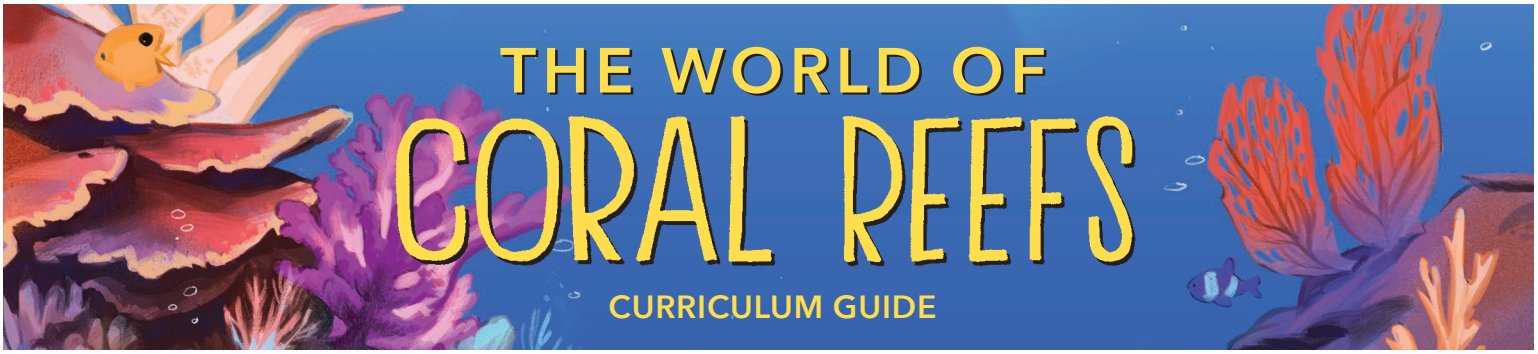
THE WORLD OF CORAL REEFS

CURRICULUM GUIDE



Storey Publishing
storey.com



The World of Coral Reefs covers a wide range of topics, including coral biology, evolution, coral reef food webs, threats facing reefs, and current research. See our curriculum guide below to learn how you can include the content of this book in your classroom. The following discussion questions align with the Next Generation Science Standards for grades 2–5 and are organized by Disciplinary Core Ideas (DCIs).

2ND GRADE

2-LS4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.

Applicable sections from *The World of Coral Reefs*:

- Rainforests of the Sea
- The Great Barrier Reef
- An Ecosystem in Balance

Potential discussion questions:

- How many animals can you spot in the illustration in "Rainforests of the Sea"? How do they look different? How are they the same?
- In "The Great Barrier Reef," we learned about *biodiversity*. What does that mean? What do you think makes a place like the Great Barrier Reef a good home for different types of plants and animals?
- Let's research other types of habitats that have a lot of *biodiversity*. Compare and contrast these habitats to the Great Barrier Reef. How are they similar? How are they different?

2-ESS1 EARTH'S PLACE IN THE UNIVERSE

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Applicable sections from *The World of Coral Reefs*:

- A Reef Is Born

Potential discussion questions:

- We learned that reefs can change from one type to another over time. Take the three steps outlined in "From Island to Atoll" and predict how long each step will take. Let's research together to find the answers.

3RD GRADE

3-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

3-LS2-1. Construct an argument that some animals form groups that help members survive.

Applicable sections from *The World of Coral Reefs*:

- The Building Blocks of Reefs
- Soft, Swaying Corals
- One Polyp Becomes Many

Potential discussion questions:

- We learned in "One Polyp Becomes Many" that many coral polyps can come together to form a coral colony. How might living close together be good for the coral polyps? How might it be bad?
- Hard corals and soft corals come in all shapes and sizes. Some, like the staghorn coral, grow together in a group. Why might that help them survive?

3-LS4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Applicable sections from *The World of Coral Reefs*:

- Coral Babies
- One Polyp Becomes Many
- No Backbone? No Problem!
- So Many Fish!
- Large and in Charge

Potential discussion questions:

- Some corals reproduce by spawning. Read "Coral Babies" and brainstorm other types of animals or plants that reproduce in a similar way. What are some of the advantages of producing a lot of babies?
- Corals produce many babies, called *planula*. Think of an animal that only produces a few babies at a time, like elephants. What are some of the advantages of only producing a few babies?
- Use "No Backbone? No Problem!" and "So Many Fish!" to define invertebrates and vertebrates. Can you name three other invertebrates not pictured in the book? What about three more vertebrates?
- Why might having a backbone help an animal survive? How might not having a backbone help an animal survive?
- Pick one of the animals featured in "No Backbone? No Problem!" Use resources in the classroom to research your animal and pick five fun facts to share with your classmates. What are some of the special traits your animal uses to survive in the ocean?
- Look at the lionfish in "So Many Fish!" Some lionfish have darker stripes than others. How might that affect their chances of surviving on the reef?

3RD GRADE CONTINUED

3-LS4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Applicable sections from *The World of Coral Reefs*:

- A World of Coral
- The Building Blocks of Reefs
- Coral Babies
- So Many Fish!

Potential discussion questions:

- In "A World of Coral," we learned that the ocean is filled with warm-water coral reefs and cold-water coral reefs. Think about these two habitats. Besides temperature, how might they be different? Do you think animals that live on warm-water reefs are also found on cold-water reefs? Why or why not?
- Pick one of the corals featured in "The Building Blocks of Reefs." Use your classroom resources to find where your coral is found on Earth. Why do you think it likes living in those areas, but not others?

3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Applicable sections from *The World of Coral Reefs*:

- The Reefs Need Our Help
- Warmer Oceans Hurt Corals

Potential discussion questions:

- In "The Reefs Need Our Help," there are two suggestions for how you can help reduce pollution in the ocean. Which of the two do you think is more effective? Why?
- What are some of the ways you think pollution hurts coral reefs? Can you think of another habitat that is hurt by pollution?
- You are officially in charge of reducing pollution in your town or city. What are three things you're going to do to help reduce pollution? Why did you choose those three?
- There are six ways to help reduce climate change listed in "Warmer Oceans Hurt Corals." Rank them in order of what you think is most helpful to least helpful. Which strategy did you rank as "most helpful"? Why?
- Brainstorm some of the ways coral bleaching might hurt other animals on the reef.
- Make a poster and draw a healthy, thriving reef on one side and a bleached coral reef on the other. Add three ways warming waters hurt reefs, and three ways we can help the ocean stop warming.

3RD GRADE CONTINUED

3-ESS3 EARTH AND HUMAN ACTIVITY

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Applicable sections from *The World of Coral Reefs*:

- Coral Reefs Help People

Potential discussion questions:

- In "Coral Reefs Help People," we learned that reefs help protect us from storms. Use your classroom resources to investigate why that happens. Can you find another ocean habitat that helps protect people from storms?

4TH GRADE

4-LS1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Applicable sections from *The World of Coral Reefs*:

- Coral Close-Up
- The Building Blocks of Reefs
- Soft, Swaying Corals
- No Backbone? No Problem!
- So Many Fish!
- Large and in Charge

Potential discussion questions:

- Look at the nematocysts shown in "Coral Close-Up." How do these help corals survive?
- Corals aren't the only animals that have nematocysts. Use your classroom resources to identify two other animals that have nematocysts. What are the different ways they use them to survive?
- Describe how zooxanthellae help corals survive and thrive. Why do zooxanthellae like to live in corals? Do you think corals could survive on their own? Why or why not?
- How do coral polyps use their tentacles? Corals aren't the only animals with tentacles. Use your classroom resources to find three other animals that have tentacles. For each, describe how they help the animal move, eat, or protect themselves.
- Use "The Building Blocks of Reefs" and "Soft, Swaying Corals" to compare and contrast hard and soft corals. What are some unique traits each of them have that help them survive in the ocean?
- There are five different types of animals featured in "No Backbone? No Problem!" Name some of the unique structures you see on each. How do you think these structures help them survive in their environment?

4TH GRADE CONTINUED

4-LS1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

More potential discussion questions:

- Design your own invertebrate that can live on a coral reef. What kinds of structures or traits does it have? What size/color/shape is it? How do these qualities help them succeed on the reef?
- There are six different types of fish featured in "So Many Fish!" List the traits for each fish mentioned in this section. How do you think each of these traits help the fish survive on the reef?
- Use your classroom resources to find a fish that isn't included in "So Many Fish!" What unique structures or traits does this fish have? How do they help the fish survive on the reef?
- Imagine the scorpion fish was transplanted from the reef to the open ocean. Do you think it would survive? Why or why not?
- In "Large and in Charge," we learned that reef manta rays are filter feeders. What does this mean? Use your classroom resources to research another animal that is a filter feeder. How does their mouth compare to another fish that isn't a filter feeder?
- Hawksbill sea turtles have a sharp beak, which inspired their name! How do you think this helps them eat their favorite food of sponges? Use your classroom resources to look up other species of sea turtle. How are their mouths similar or different to hawksbill sea turtles? Can you brainstorm what types of food they might like to eat?

4-ESS2 EARTH'S SYSTEMS

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

Applicable sections from *The World of Coral Reefs*:

- A World of Coral

Potential discussion questions:

- We can see in "A World of Coral" that there are corals all around the world! Is that surprising to you? Why or why not?
- Use the map in "A World of Coral" to pick one of the four oceans shown. Use your classroom resources to research coral reefs in your ocean. What are three fun facts you can share about reefs in your ocean?

5TH GRADE

5-PS3 ENERGY

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Applicable sections from *The World of Coral Reefs*:

- Coral Close-Up
- One Polyp Becomes Many

Potential discussion questions:

- In "Coral Close-Up" we see that coral polyps get their color from algae called zooxanthellae. Zooxanthellae are also known as primary producers. Use your classroom resources to identify what you think that means. Draw a picture to illustrate how the sun, zooxanthellae, coral polyps, and coral reefs are related. Use "Coral Close-Up" and "One Polyp Becomes Many" to help you.
- Consider the relationship between zooxanthellae and coral polyps. Predict what would happen if coral polyps couldn't get any sunlight. How would the zooxanthellae and coral polyps respond?

5-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Applicable sections from *The World of Coral Reefs*:

- An Ecosystem in Balance
- No Backbone? No Problem!
- So Many Fish!
- Large and in Charge

Potential discussion questions:

- There are many different types of animals highlighted in "An Ecosystem in Balance." Of the following, which do you think are herbivores and which are carnivores (hint: Look at "So Many Fish!" for the vocab words): green sea turtles, grouper, urchins, and worms.
- Some invertebrates are herbivores, some are carnivores, and some can be both! Use your classroom resources to give an example of each.
- Parrotfish munch on the algae that grow on coral. Do you think this helps or hurts the coral? Why?
- Blacktip reef sharks are one type of shark we learn about in "Large and in Charge." Use your classroom resources to research other types of sharks. Can you find an example of an "apex" predator? Can you find a shark that is a filter feeder?

5TH GRADE CONTINUED

5-ESS3 EARTH AND HUMAN ACTIVITY

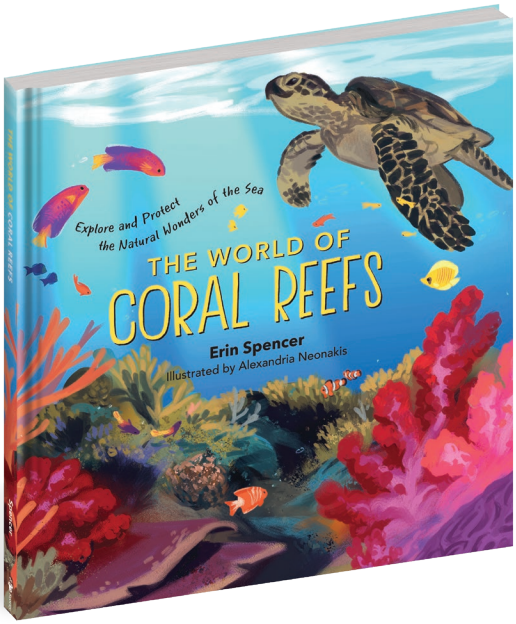
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Applicable sections from *The World of Coral Reefs*:

- The Reefs Need Our Help
- Trash Talk
- Warmer Oceans Hurt Corals
- Science at Work

Potential discussion questions:

- To protect coral reefs, we want to use ocean-friendly products in our yards and gardens. Use your classroom resources to research a product that is "ocean safe." What makes it less harmful to our oceans?
- Name three reasons why trash is harmful to the ocean. What are three ways you can help keep trash out of the ocean?
- Why does ocean warming hurt coral reefs? What are two things that contribute to warming?
- Name three ways researchers are helping to study and protect the reefs. If you had unlimited money, how would YOU design a research project to help the reefs?



Storey Publishing
storey.com