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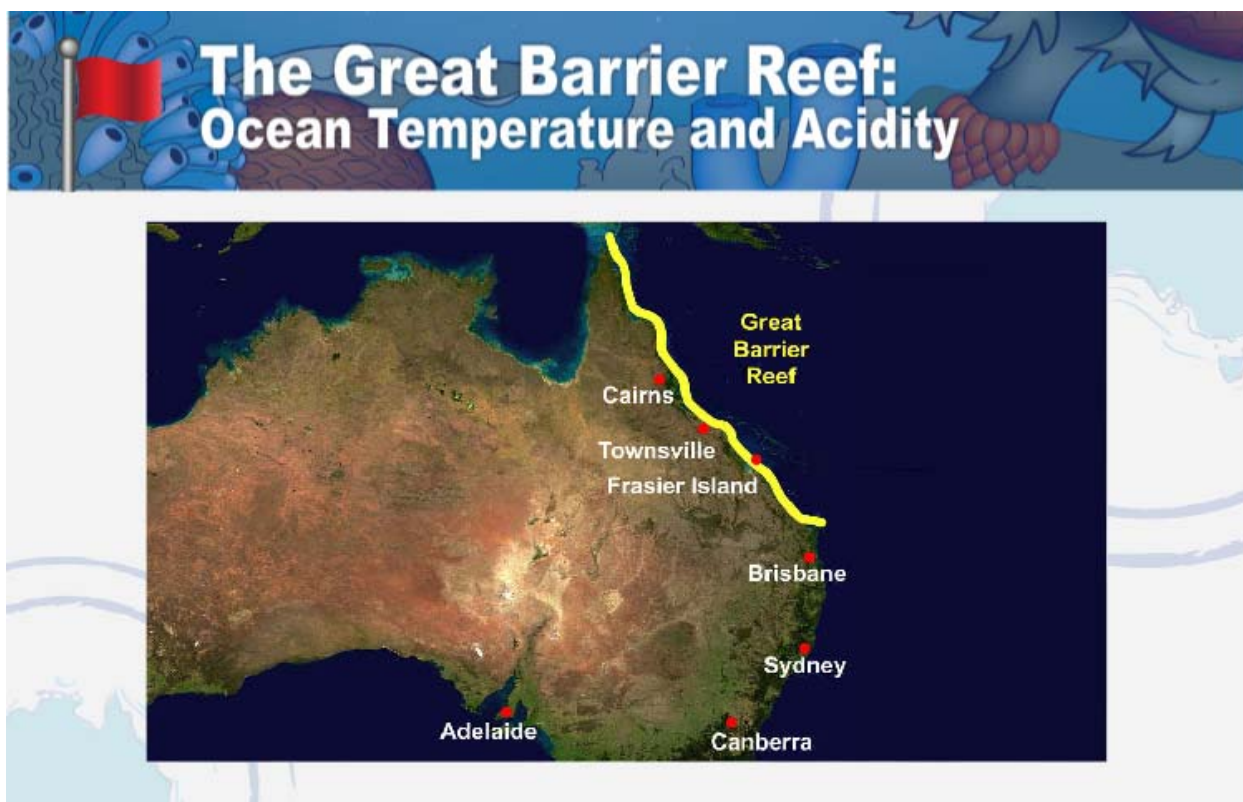
## Expedition to Australia's Great Barrier Reef to Learn About Ocean Temperature and Acidity

### Part 1. Introduction.

*Narrator:* Good day mate! Happy to have you here down under! While you're here in Australia, be sure to strap on your snorkeling gear and check out the world famous Great Barrier Reef – the largest coral reef on Earth!

Coral reefs are found in shallow tropical waters and provide habitat for thousands of different kinds of fish and other animals. The Great Barrier Reef stretches for more than a thousand miles along the coast of Australia, and it's the largest object on Earth made by living things. In fact, it's so big that astronauts can see it from space!

However, the greenhouse gases that people are putting into the atmosphere are hurting the Great Barrier Reef and other coral reefs. Two of the biggest threats to coral reefs are rising water temperatures and increasing ocean acidity.



### Part 2. The Climate Connection: Ocean Temperature.

*Narrator:* Coral reefs are made up of hundreds of thousands of tiny animals called corals. Each coral has microscopic algae living inside it. These algae are what make coral reefs so colorful. The corals provide the algae with a home and nutrients, and in return, the algae produce food that the corals need to survive.

The world's oceans are getting warmer because of climate change. When ocean water heats up more than normal—even by just a few degrees—it makes it hard for corals to provide enough nutrients to their algae, and the algae can either leave or die. When this happens, the corals turn white and become “bleached.” If the water cools down again, the algae may come back, and the corals may recover. But if the water stays too warm, the algae stay away and the corals will die, leaving only their skeletons behind.

### Part 3. Coral Bleaching: A Worldwide Problem.



*Narrator:* The dots on this map show locations where coral bleaching has already taken place. As you can see, bleaching is happening all over the world, and the problem is expected to get worse if the oceans continue to warm up.

### Part 4. The Climate Connection: Double Trouble.

*Narrator:* Bleaching is not the only threat to coral reefs. The main greenhouse gas produced by human activities is carbon dioxide, and the ocean is absorbing some of this extra carbon dioxide from the atmosphere.

When carbon dioxide mixes with sea water, a chemical reaction occurs that creates carbonic acid—the same thing you find in carbonated soda. Extra carbonic acid is making the ocean more acidic. This slight change in the ocean's chemistry can make it harder for some creatures like corals and clams to build the skeletons and shells they need for protection.

## Part 5. Test Your Knowledge.

# Test Your Knowledge!

This graph shows how the average temperature of the ocean surface has changed over the last 130 years.

**Question**

Which time period BEST illustrates the overall trend in sea surface temperatures?

**Choose the correct answer:**

- 1910 to 1940 and 1970 to 2009, because the temperature increased the most.
- 1880 to 1910, because it shows decreasing temperature.
- 1880 to 2009, because it accounts for all changes over the longest period of time.

*Narrator:* Let's test your knowledge about climate change and coral reefs. This graph shows how the average temperature of the ocean surface has changed over the last 130 years. Which time period BEST illustrates the overall trend in sea surface temperatures?

*The text on the screen asks:* "Which time period BEST illustrates the overall trend in sea surface temperatures?" You have three choices:

- A. 1910 to 1940 and 1970 to 2009, because the temperature increased the most.
- B. 1880 to 1910, because it shows decreasing temperature.
- C. 1880 to 2009, because it accounts for all changes over the longest period of time.

*Answer:* The correct answer is C. To determine trends and relate them to climate change, it's important to look at the big picture. By looking at the whole timespan from 1880 to 2009, you can see that sea surface temperature has increased overall.

## Part 6. Reefs at Risk.

*Onscreen:* A photo of a healthy coral reef, followed by a photo of a dead reef.

*Narrator:* Here's a healthy coral reef. Now we're looking at a dead coral reef. See the difference?

In addition to climate change, coral reefs face many other challenges. Pollution, trash, coastal development, overfishing, and careless boaters and divers can all damage coral reefs. Together, all of these threats are putting many reefs at risk.

You may have heard the term biodiversity. It refers to the number and variety of plants, animals, and other living things in a particular area. The world's biodiversity would decrease greatly if corals disappeared, because thousands of different creatures live in and around reefs.

People depend on coral reefs, too. By providing habitat for plants and animals, coral reefs support the ocean food web and the fishing industry. Reefs like the Great Barrier Reef also promote tourism, which provides jobs. And coral reefs help protect the shoreline from wave and storm damage.

### Part 7. Test Your Knowledge!

*Narrator:* Now, let's test your knowledge one more time about climate change and coral reefs. "Ecosystem services" is a term that's used to describe the benefits that people get from an ecosystem. What ecosystem services do coral reefs provide?

*The text on the screen asks:* "What ecosystem services do coral reefs provide to people?" You have four choices:

- A. Habitat for fish that people eat.
- B. Valuable tourist destinations and income for coastal communities.
- C. Protection from wave and storm damage.
- D. All of the above.

*Answer:* The correct answer is D. Coral reefs provide people with all these services and many more.

### Part 8. Can We Rescue the Reefs?

*Narrator:* You can help protect coral reefs from the impacts of climate change by taking steps to reduce your own carbon footprint. Conserving energy and water are two important actions you can take. You can help reduce other stresses on coral reefs, too. If you go to the beach, be sure to dispose of your trash properly, and if you snorkel or dive around reefs, be careful not to touch or step on the corals.

### Part 9. What Have You Learned?

*Narrator:* Put away your snorkeling gear; your journey to Australia and the Great Barrier Reef is over. What have you learned?

*Onscreen text:* More carbon dioxide in the atmosphere is causing increases in ocean temperature and ocean acidity.

*Narrator:* Climate change is causing the ocean to become warmer. The extra carbon dioxide that people have added to the atmosphere is also causing the ocean to become more acidic.

*Onscreen text:* Warmer water can lead to coral bleaching, while more acidic water can make it harder for corals and shellfish to build their skeletons and shells.

*Narrator:* Warmer water can lead to bleaching, which can cause some corals to die. More acidic water can make it harder for corals and shellfish to build their skeletons and shells.

*Onscreen text:* Coral reefs provide many important ecosystem services for people.

*Narrator:* Coral reefs are important to protect because they provide many ecosystem services that benefit people.

*Onscreen text:* There are many actions people can take to protect and preserve coral reefs.

*Narrator:* There are many actions people can take to protect and preserve coral reefs. Reducing carbon dioxide emissions helps, and so does protecting reefs from other environmental stresses such as pollution.

#### Part 10. Congratulations!

*Narrator:* Congratulations! You've earned a passport stamp by learning how climate change affects ocean temperature, acidity, and coral reefs.

*Onscreen code:* 174593