Lesson 3: Coral Reef Rescue Mission

Theme: Improving Resilience of Florida’s Coral Reef

Grade Levels: 3-5

Duration: Two 45- to 60-minute class periods

OBJECTIVES

- Understand reef resilience and what a resilient reef looks like.
- Describe why reef resilience is important.
- Design creative solutions to each environmental stressor that impacts Florida’s Coral Reef.

Students will continue to explore local threats to Florida’s Coral Reef. They will participate in a problem-based learning activity in which they work as a cooperative group to design a solution to a local threat to improve reef resilience.

Next Generation Sunshine State Standards:

SC.3.N.1.1 Raise questions about the natural world; investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.4.N.1.1 Raise questions about the natural world; use appropriate reference materials that support understanding to obtain information (identifying the source); conduct both individual and team investigations through free exploration and systematic investigations; and generate appropriate explanations based on those explorations.

SC.4.L.17.4 Recognize ways plants and animals, including humans, can impact the environment.

SC.5.N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as systematic observations; experiments requiring the identification of variables; collecting and organizing data; interpreting data in charts, tables and graphics; analyze information; make predictions; and defend conclusions.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants - such as life cycle variations, animal behaviors and physical characteristics - that enable them to survive in different environments.

MATERIALS

- Lesson 3 PowerPoint.
- Coral 3D printed models (one per team).
- Large bowl (one per team).
- Warm water for bowl.
- Coral rescue mission card (one per team).
- Coral rescue mission sheet (one per team).
- Large paper/poster (one per team).
- Markers or crayons (one set per team).
- Reflection sheet (one per student).
Background Information

Coral reefs only cover 1% of the planet, but they are home to 25% of marine species. In Florida, the five counties that border the reef (Monroe, Miami-Dade, Broward, Palm Beach and Martin) are home to more than 6 million people and host 38 million visitors each year. The reef supports 71,000 jobs annually among the five counties. Florida's Coral Reef protects our coastal communities and beaches from shoreline erosion and provides habitat for the seafood we like to catch and eat. The reefs are also a key component of tourism in Florida. In addition, medicines for pain, inflammation and other ailments have been derived from coral reef organisms and are already on the market.

Lesson Procedure

Coral Reef Resilience

*Prior to start of lesson, split teams into groups of four and have warm water and 3D models of coral polyps ready for each team to use. Use accompanying PowerPoint for visuals.*

*Talk to your team about the threats to coral reefs that we learned about in previous lessons.*

- Physical damage, such as people anchoring boats on the reef or people kicking or standing on the reef while they’re snorkeling or scuba diving, or damage caused by major storms and hurricanes.
- Pollution that originates on land and flows into the ocean and out to the reef.
- Overfishing.
- Marine debris.
- Coral bleaching.
- Ocean acidification.

*We know the results of these threats. How do you think coral reefs recover from the impacts and stressors they experience?*

Reef resilience is a coral reef's ability to maintain key functions in the face of environmental stressors, storms and human pressures by either resisting or recovering from the impacts. Coral reef resilience is ultimately about coral reef health. For a reef community to be resilient, it must also be able to survive, reproduce and compete for space and resources.
There are several things that can improve reef resilience, but one of the best ways is to lower human impacts and stressors to the reefs in our area. All stressors need to be continually reduced for long-term reef resilience.

Why do you think it is so important to protect coral reefs and support reef resilience? (Talk to your team.)

Healthy reefs can better cope with and recover from major stress events like hurricanes, coral bleaching and coral disease outbreaks. According to the National Oceanic and Atmospheric Administration (NOAA), coral reefs cover only 1% of the planet but are home to 25% of marine species. Florida’s Coral Reef is home to over 500 species of fish and 43 species of stony, reef-building corals. The reef provides habitat and food for many of the creatures we catch and eat, like fish and spiny lobster.

More than 6 million people live along Florida’s Coral Reef, which supports over 71,000 jobs in South Florida and generates more than $6.3 billion in local sales and income each year. The reef also provides vital protection for our coastal communities from flooding during storm events.

Coral reefs are very important to the health of our oceans, which, in turn, means the health of our Earth and the people and animals who inhabit it. A world without coral reefs would be devastating!

Today, we are going to take a firsthand look at bleached corals, and then we are going to go on a coral reef rescue mission with our teams.

Coral Reef Rescue Mission

Students will work as teams of four to come up with a creative solution to a specific stressor that impacts Florida’s Coral Reef.

Explain to students that they will take a closer look at coral bleaching.

Ask students to explain what coral bleaching is. After listening to their explanations, show them this 1-minute video: What Is Coral Bleaching? Coral bleaching occurs when corals become stressed and the algae that live within the coral tissues are expelled. The algae, called zooxanthellae, are what give corals their bright colors. Otherwise, coral tissues are translucent. That’s why corals appear white when they go through bleaching – you see through the tissue to the white skeleton. Corals are not dead when they bleach, but they do become more susceptible to disease and other stressors that could kill them. There are many factors that can cause corals to become stressed, including warming ocean temperatures, poor water quality and exposure to too much sunlight.

Today, we will model how this occurs with our teams. Pass out bowls of warm water, coral polyp models and reflection sheets. Instruct everyone to not touch the objects until it is time to begin.
Here is a short video\(^2\) that shows how the models work.

These are special 3D printed models of coral polyps. They are made from material that responds to heat, much like real life coral polyps.

What do you think might happen if we put these models into the warm water? They might lose their color.

Taking turns, each team member may gently flip over the coral polyp and put it into the warm water. Observe the changes in the coral with your team. Record your observations on your reflection sheet.

Collect models and materials.

Now that we’ve seen how coral bleaching can occur, our job is to help prevent this from happening. Florida’s Coral Reef and reefs around the world are so important and we need to do whatever we can to try and protect them.

Every team is going to receive a scenario that explains a stressor that is affecting the health of Florida’s Coral Reef. You and your team are embarking on a coral reef rescue mission. Your mission is to come up with a creative solution to this stressor affecting the reef.

Pass out scenarios. Give teams a few minutes to review. Circulate and check in with each team to be sure they understand their mission.

You will now use your remaining time to complete your mission.

Be as creative as you can be. There are no limits. Your solution can include an invention, a new procedure or plan to address the problem. You will present your plan at the end of the class time today.

Students will complete their rescue mission sheet. The sheet will include an explanation of the problem, a space for drawing their invention or new procedure, a write-up explaining their plan, and why it’s important to solve this problem for better reef resilience. Circulate and assist students with the process.

**Lesson Wrap-Up**

At the end of the project, give students the opportunity to share their plans with the audience. We would love to see pictures of their work! Email them to Coral@FloridaDEP.gov.
Hyperlink Web Addresses

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1. YouTube.com/watch?v=fA6mpexcyN4

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2. CoralReef.NOAA.gov/education/polypmodel.html