

OCEAN CLASSROOM

The Study of Corals

Efforts to Save Coral Reefs

EDUCATOR GUIDE

THE
UNIVERSITY
OF RHODE ISLAND
GRADUATE SCHOOL
OF OCEANOGRAPHY

Guiding Question

“How can we save coral reefs?”

Day 1

Time required: 45 minutes

Procedure: Ask the class what “Conservation” means. Come up with a class definition and have them write it in their science notebooks.

Ask the class what “Restoration” means. Come up with a class definition and have them write it in their science notebooks.

Show the class a couple of Coral Conservation videos from the list below:

Videos about Saving Coral Reefs:

<https://oceantoday.noaa.gov/restoringcoralreefs/>

<https://oceantoday.noaa.gov/fullmoon-whatcanwedo-coral/welcome.html>

https://www.youtube.com/watch?v=ytXM5IKva0g&ab_channel=Waterlust

<https://www.youtube.com/>

[watch?v=8hknaJQRh8s&ab_channel=Travel%2BLEisure](https://www.youtube.com/watch?v=8hknaJQRh8s&ab_channel=Travel%2BLEisure)

Videos about Growing Corals:

<https://www.youtube.com/>

[watch?v=48PxHyaK3GA&ab_channel=SECOREcoral](https://www.youtube.com/watch?v=48PxHyaK3GA&ab_channel=SECOREcoral)

https://www.youtube.com/watch?v=qHKpcnn5Tws&ab_channel=TheAtlantic

Ask the groups to research and identify 5-8 things that can be done to help protect coral reefs. The teacher can make a list at the front board as the groups share their results. Here is an excellent site for kids: <https://oceanservice.noaa.gov/facts/thingsyoucando.html>

Here are some extra ways (if you need some) that students can help coral reefs:

You can be mindful of the fish that you eat and make sure to eat fish that are sustainably harvested by using websites like NOAA’s Fishwatch (www.fishwatch.gov) to learn which species are okay to eat. Don’t purchase jewelry made with coral pieces. Don’t purchase corals as souvenirs while traveling. If you go snorkeling or diving near reefs, don’t touch the corals and be careful not to step on them or hit them with your feet. Don’t litter—it might eventually end up in our oceans. Conserve water—the less wastewater you

Day 1

(Continued)

generate, the less likely that wastewater will end up in the ocean. Teach other people what you have learned about corals. Join a coral reef conservation group. Volunteer to monitor corals on one of the many websites. Raise money to give as a donation to an agency working to save coral reefs. Conserve energy anything you do that helps the earth will indirectly help the coral reefs.

Procedure: Lastly, have students return to their seats (or assign this for homework) and have them watch the videos about “Coral Reef Restoration:”

1. http://response.restoration.noaa.gov/sites/default/files/voetrader-coral-restoration-video_final.mp4
2. <https://ocean.si.edu/ecosystems/coral-reefs/connecting-coral-reefs>
3. <https://oceantoday.noaa.gov/restoringcoralreefs>
4. https://www.youtube.com/watch?v=MUAsFZuFQvQ&ab_channel=HotMess

Day 2

Time required: 45 minutes

Procedure: Go over the directions of “Design a Mailer for a Coral Reef Conservation Group” with the class. Explain that the student sheet gives three examples of mailers. Have the students get into their groups to complete this activity.

Group Assignment:

Your group must select an agency or organization that helps coral reefs. You need to design an informational sheet (11' X 8.5") that will be mailed to people all over the world. Your mailer must include:

- 1.Name of Organization
- 2.Picture or Symbol for the organization
- 3.Purpose Statement (What you want to get accomplished)
- 4.Current Facts about Coral Reef Threats (Why coral reefs need saving)
- 5.Explain at least three ways this organization is helping save the coral reefs
- 6.Two Photos or diagrams with a caption

Here is a partial list of organizations that work to save coral reefs. There are many, many more. Pick an agency from below or feel free to find another. Research and read about their efforts, and then work as a group to create your mailer.

- Global Coral Reef Alliance
- ICRS International Coral Reef
- Reef Relief
- National Oceanic and Atmospheric Administration (NOAA)
- Ocean Preservation Society
- Great Barrier Reef Foundation
- Environmental Protection Agency (EPA)
- Nature Conservancy
- World Wildlife Foundation (WWF)
- Florida Department of Environmental Protection

Days 3 — 7*Time required: 45 minutes*

Environmental Solutions Research

Procedure: Review this research assignment with the class, telling them that this assignment has three parts—doing research, filling out the graphic organizer, and presenting your findings to the class.

Explain that they will have four days to complete this assignment. Presentations will be on Day 11. Refer to the Student Sheet for help.

Day 3 — 7

Time required: 45 minutes

Activity: Design a Super Coral

Procedure: Ask the class “What makes someone a superhero?” Let the students give you answers. Then, tell them that they are going to create a super coral! Students get in their groups. Go over the directions given on the student sheet. The groups review the videos and articles listed below. Then the students need to discuss their ideas for their super coral. Tell them to be sure to answer the questions. And lastly, they need to draw their picture.

Genetics and Super Corals, Videos and Articles:

<https://oceantoday.noaa.gov/fullmoon-scienceofsupercorals/welcome.html>

https://www.youtube.com/watch?v=6QqZ7b7ILjM&ab_channel=NationalGeographic

<https://theconversation.com/heat-tolerant-corals-can-create-nurseries-that-are-resistant-to-bleaching-116675>

<https://theconversation.com/meet-the-super-corals-that-can-handle-acid-heat-and-suffocation-122637>

Questions to Answer:

1. What is the name of your super coral?
2. Where in the world can your super coral live/survive?
3. What are the threats/pollution that are present in your location?
4. What special qualities/characteristics does your super coral have to fight these threats? (Name three)
5. How does your super coral use its special characteristics to fight the threats/pollution?

Picture:

Put the name of your super coral at the top of the paper. Draw a detailed, colorful picture of your super coral. Be sure to label its special qualities/characteristics.

Educational Standards (2/2/21)

Part 1 — Threats to Coral Reefs AND Part 2 — Efforts to Save Them

NGSS Standards, Middle School

MS-PS1 — Matter and Its Interactions

- MS.PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred
- MS.PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- MS.PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

MS-LS1 — From Molecules to Organisms: Structures and Processes

- MS.LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- MS.LS1-2 Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function
- MS.LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells
- MS.LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively
- MS.LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

MS-LS2 — Ecosystems: Interactions, Energy, and Dynamics

- MS.LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS.LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS.LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS.LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
- MS.LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Educational Standards (2/2/21)

NGSS Standards, Middle School (Continued)

MS-LS4 Biological Evolution: Unity and Diversity

- MS.LS4-5 Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

MS-ESS2 Earth's Systems

- MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions

MS-ESS3 Earth and Human Activity

- MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*
- MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century

ELA Standards

Common Core State Standards Connections: Reading Standards for Literacy (Grades 6 —8)

Science and Technical Subjects

Key Ideas and Details

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Integration of Knowledge and Ideas

- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Reading Informational Texts

Key Ideas and Details

- RI.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- RI.6-8.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
- RI.6-8.3 Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).

Craft and Structure

- RI.6-8.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

Integration of Knowledge and Ideas

- RI.6-8.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

Text Types and Purposes

- WHST.6-8.1 Write arguments focused on discipline-specific content.

Research to Build and Present Knowledge

- WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; Text Types and Purposes quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Speaking and Listening

Comprehension and Collaboration

- CCSS.ELA-Literacy / SL.6-8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on topics, texts, and issues, building on others' ideas and expressing their own clearly.
- CCSS.ELA-Literacy / SL.6-8.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

Presentation of Knowledge and Ideas

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings reasoning and evidence and to add interest.

*** OR ***

- CCSS.ELA-Literacy / SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2)

Writing

Text Types and Purposes

- W.6-8.1 Write arguments to support claims with clear reasons and relevant evidence.
- W.6-8.2 (abbreviated) Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

Production and Distribution of Writing

- W.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Research to Build and Present Knowledge

- W.6-8.7 (abbreviated) Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

Resources

“Threats to Coral Reefs” and “Efforts to Save Them”

<https://www.epa.gov/coral-reefs/threats-coral-reefs>

United States Environmental Protection Agency discusses the many threats to coral reefs and the process of ocean acidification

https://wwf.panda.org/discover/our_focus/oceans_practice/coasts/coral_reefs/coral_threats/

WWF discusses various destructive human activities that exist today and the harm they cause to corals, coral reefs, as well as their habitats

https://oceanservice.noaa.gov/education/tutorial_corals/coral09_humanthreats.htm

NOAA gives lots of research about human practices that are major threats to coral reefs all around the world. Threats include pollution, overfishing, aquarium markets, destructive fishing practices using dynamite, mining coral for building materials, and a warming climate are some of the many ways that are discussed

<https://coral.org/coral-reefs-101/reef-threats/>

This site explores the multiple stressors that coral reefs face; both direct threats and global threats are discussed, as well as the destruction they cause.

<https://oceanservice.noaa.gov/facts/coral-pollution.html>

NOAA's site is filled with facts about coral reefs that exist around the world. Also, they discuss the many serious coral reef ecosystem stressors that originate from land-based sources including harmful pollution, notable toxicants, sediments, and nutrients.

<https://coast.noaa.gov/states/fast-facts/state-of-climate.html>

This NOAA site not only discusses the topic of pollution and how it affects coral reefs, but it also goes into depth about global warming- the causes and its detrimental effects to our oceans inhabitants.

<https://www.exploratorium.edu/snacks/ocean-acidification-in-cup>

Here is an easy experiment called “Ocean Acidification in a Cup” that includes clear directions, a video and detailed explanations. It can be used for grades 2-5, or follow the experiment extension for grades 6-12.

Resources (Continued)

<https://mass.pbslearningmedia.org/resource/0d5be00d-db70-4b6a-ab25-f95175958c00/>

[coral-bleaching-activity-hhmi-biointeractive/support-materials/](https://mass.pbslearningmedia.org/resource/0d5be00d-db70-4b6a-ab25-f95175958c00/coral-bleaching-activity-hhmi-biointeractive/support-materials/)

This computer-based activity is called “Coral Reefs and Global Warming”. Students download, graph, and analyze authentic satellite temperature data for coral reef sites around the world. After observing global trends in the data, students evaluate the threat to coral reefs from heat stress. The complete Teacher’s manual can be found at: https://d43fweuh3sg51.cloudfront.net/media/media_files/Coral-Activity-Teacher.pdf

<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

The United States Environmental Protection Agency (EPA) has identified activities that cause greenhouse gasses to be emitted into our atmosphere. There are not only facts and definitions, but also numerous charts and graphs about the increase in greenhouse gases over the years.

<https://climatekids.nasa.gov/offset/>

An easy, colorful game that helps students learn about the global carbon cycle

<https://www.fisheries.noaa.gov/feature-story/noaas-vision-thriving-diverse-and-resilient-coral-reef-ecosystems>

The NOAA Coral Reef Conservation Program discusses coral research, conservation, and restoration efforts. The program’s plan outlines a framework for reducing the main threats to coral reef ecosystems which include climate change, fishing impacts, and land-based sources of pollution. There are many up-to-date feature stories too.

<https://www.fisheries.noaa.gov/national/habitat-conservation/restoring-coral-reefs>

The NOAA Restoration Center works with other NOAA offices and partners to help corals recover. Their efforts include activities such as planting nursery-grown corals back onto reefs, making sure habitat is suitable for natural coral growth, and building coral resilience to threats like climate change

https://www.teachengineering.org/content/cub_/lessons/cub_whatkindoffootprint/cub_footprint_lesson01_worksheet_v3_tedl_dwc_new.pdf

A worksheet that allows the student to understand how you can create a carbon footprint

Resources (Continued)

<https://www3.epa.gov/carbon-footprint-calculator/>

The amount of CO² released into the atmosphere because of one's own energy needs is called your "carbon footprint." This site helps you to calculate your personal carbon footprint.

<https://coral.org/what-you-can-do/take-action/every-day/>

This agency is dedicated to saving coral and shares the ways you can help them

<https://education.abc.net.au/home#!/media/524983/can-coral-reefs-survive->

This site contains 20 videos depicting the harm we are causing to our planet and its inhabitants. Coral reefs are called the 'rainforests of the oceans' and the videos show you where the world's coral reefs are concentrated and why they are so important for marine life, to the coastal environment and to people. Also you will discover the threats to coral reefs around the world and how to help them

<https://oceantoday.noaa.gov/fullmoon-scienceofsupercorals/welcome.html>

This site contains five short videos about coral reefs, their aquatic habitat, factors that harm them and ways to protect them. In this 5 minute video, you'll see that corals have been devastated by the past few years of intense ocean heat, but coral scientists are getting closer to understanding what makes a coral "super"—able to withstand high temperatures—and it may have to do with what's inside a coral's cells.