Lesson Plans and Activities for Educators
Grades 9-12

Coral Reef Resource Guide

Source: EPA and University of Southern Mississippi

Lesson Summary: A comprehensive and easy to use guide containing 55 lessons and activities related to coral reefs. Many activities can be adapted to various grade levels. Simply click on the pdf of the lesson you are interested in using in your classroom. English and Spanish.

Grade Level: K-12

Go to: http://www.usm.edu/aquarium/old/coralreef/index.html

Are You Concentrating?

Source: NOAA Aquarius Undersea Laboratory

Lesson Summary: Students will be able to explain the concept of concentration gradient, the effect of flow velocity on concentration gradients and the importance of concentration gradients and flow velocity to the nutrition of reef-building corals.

Grade Level: 9-12

Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20Concentrate.pdf

Beach Profiling

Source: New Jersey Marine Sciences Consortium

Lesson Summary: Waves, wind and currents shape the beach redistributing tons of sand each day. During this activity, students gather data that measures the surface of the beach using a method that simulates the way marine scientists and coastal geologists study our dynamic beaches. Students will be able to understand that waves, winds, currents shape the beach and redistribute tons of sand each day; identify storm and tide levels as well as how a beach is changing over time; make and record observations; and graph the beach profile.

Grade Level: 6-12

Go to: http://www.njmsc.org/Education/Lesson_Plans/Beach_Profiling.pdf **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Beach Zonation

Source: New Jersey Marine Sciences Consortium

Lesson Summary: During this activity, students investigate beach zonation by gathering and comparing sand samples gathered from different areas of the beach. Students will be able to identify and separate the different zones of the beach by observation of various visual characteristics, including grain size and composition; understand that the zones of the beach respond to weather, waves and human actions; draw conclusions about how beaches work.

Grade Level: 4-12

Go to: http://www.njmsc.org/Education/Lesson_Plans/Beach_Zonation.pdf **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Blue Planet: Coral Seas

Source: Discovery School

Lesson Summary: Students will be work in small groups to identify basic information about coral polyps and coral reefs, coral reef habitats, and natural threats to coral reefs; create a poster

related to one of these topics; and explain the topic to the class via a presentation. This lesson accompanies the Discovery Channel: Blue Planet Seas of Life series.
Grade Level: 6-8, adaptable to 9-12
Go to: http://school.discovery.com/lessonplans/programs/BP_coralseas/

Can't Stand the Pressure

Source: Coral Reef Adventure Film
Lesson Summary: Students will construct a device to experiment with pressure, density, floating and sinking, and will make observations of these phenomena.
Grade Level: 6-10
Go to: http://www.coralfilm.com/CRAEducatorGuide.pdf

Catch, Tag and Release

Source: New Jersey Marine Sciences Consortium
Lesson Summary: Determining the number of fish living in a given body of water is crucial to maintaining fish stocks and preserving species. During this lesson, students participate in a simulation of fish tagging and recapture, a method used by marine biologists and fisheries managers to estimate fish populations. Students will be able to apply estimation strategies for problem-solving purposes and become familiar with one aspect of a marine biologist's work.
Grade Level: 6-12
Go to: http://www.njmsc.org/Education/Lesson_Plans/Catch_Tag_Release.htm **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Caution: Do Not Bleach!

Source: NOAA NOS
Lesson Summary: Students will be able to identify and explain five ways that coral reefs benefit human beings; identify and explain three major threats to coral reefs; describe major components of the Coral Reef Early Warning System; identify and discuss actions that can be undertaken to reduce or eliminate threats to coral reefs; discuss at least one hypothesis that explains why corals under stress may expel their zooxanthellae.
Grade Level: 9-12, adaptable to 6-8
Go to: http://oceanservice.noaa.gov/education/kits/corals/lessons/coral_bleach.pdf or http://oceanservice.noaa.gov/education/kits/corals/supp_coral_lessons.html

Clarity and Turbidity

Source: New Jersey Marine Sciences Consortium
Lesson Summary: Students will be able to identify possible environmental complications that can be attributed to clarity and turbidity, and measure the clarity of a body of water.
Grade Level: 4-12
Go to: http://www.njmsc.org/Education/Lesson_Plans/Clarity_and_Turbidity.htm **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Coral Aging

Source: Nick Tagliareni
Lesson Summary: Using x-radiographs of slabbed coral cores, students will average coral growth rates over ten year increments and graph the results. To help students get a feel for the

time frame associated with coral growth, they will identify world or U.S. events for some of the years listed.
Grade Level: 6-12
Go to: SEFCRI Teacher Resource CD

Coral Bleaching: What's the Role of Water Temperature?

Source: NOAA CHAMP
Lesson Summary: Students will be able to graph and analyze data sets and determine the temperature threshold required to start a coral bleaching event.
Grade Level: 6-8, adaptable to 9-12
Go to: http://www.coral.noaa.gov/cleo/pdf/Bleaching%20Lesson.pdf or http://www.coral.noaa.gov/cleo/education.shtml

Coral Crossword Challenge

Source: NOAA Aquarius Undersea Laboratory
Lesson Summary: Students will complete a cross word using coral reef knowledge.
Grade Level: 6-12
Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20coral%20crossword.pdf

Coral Reef Book

Source: Discovery School
Lesson Summary: Students will be able to write and illustrate short books that explain to younger children how the animals that inhabit coral reefs are uniquely suited to their environment.
Grade Level: 6-8, adaptable to 9-12
Go to: http://school.discovery.com/lessonplans/programs/coralreefs/

Coral Reef Jeopardy

Source: Florida Sea Grant
Lesson Summary: Based on the game Jeopardy!, students will be challenged to compose the correct question when an answer is given related to coral reef biodiversity, reproduction, zonation, threats and facts about southeast Florida coral reefs.
Grade Level: 5-12
Go to: SEFCRI Teacher Resource CD

Coral Spawning

Source: NOAA CHAMP
Lesson Summary: A simple and effective lesson that allows students to explain why corals gain some reproductive advantage by spawning all at once.
Grade Level: 6-8, adaptable to 9-12
Go to: http://www.coral.noaa.gov/cleo/modules/spawning_educational_module.pdf or http://www.coral.noaa.gov/cleo/education.shtml

Counting Fish Stix

Source: NOAA Aquarius Undersea Laboratory

Lesson Summary: Students will be able to describe and demonstrate a visual census technique commonly used to survey reef fish populations and analyze and interpret data from surveys of coral reef fish populations.
Grade Level: 9-12
Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20FishStix.pdf

Design a Fish

Source: Gulf of Maine Aquarium
Lesson Summary: Students will design a fish adapted for a coral reef and another for cold marine environments.
Grade Level: 6-12
Go to: http://octopus.gma.org/surfing/ocean/fish.html

Designing an Autonomous Underwater Vehicle (AUV):

Concepts in Lift, Drag, Thrust, Energy, Power, Mass, and Buoyancy

Source: NOAA Aquarius Undersea Laboratory
Lesson Summary: Students will construct a model of an Autonomous Underwater Vehicle (AUV), explain how drag, thrust, and lift forces affect the performance of their model AUV, explain how their AUV can be designed to optimize drag, thrust, and lift forces, compare and contrast the locomotion of AUVs and aquatic organisms like fishes, sea turtles, or whales, explain the difference between mass and buoyancy of an object immersed in water, and explain why AUVs and aquatic organisms need to adjust their buoyancy.
Grade Level: 9-12
Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20AUV.pdf

Dive In!

Source: NOAA Aquarius Undersea Laboratory
Lesson Summary: Students will be able to explain Archimedes' Principle, and explain how this principle applies to scientists working underwater; identify the source of atmospheric and underwater pressure, and explain how these pressures vary with altitude and depth; and identify two ways in which light is affected when it passes through water.
Grade Level: 9-12
Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20Dive%20In.pdf

Effects of CO_2 on Coral Reefs

Source: NOAA CHAMP
Lesson Summary: Students will be able to explain the role of carbon dioxide (CO_2) in photosynthesis and cellular respiration and carbonic acid's impact on calcification and dissolution of coral skeletons, and its ability to influence pH.
Grade Level: 6-8, adaptable to 9-12
Go to: http://www.coral.noaa.gov/cleo/pdf/CO2Activity.pdf or http://www.coral.noaa.gov/cleo/education.shtml

Fish Morphology

Source: New Jersey Marine Sciences Consortium

Lesson Summary: Students study the parts of a fish to develop the understanding that the shape, form and structure of a fish's parts influence its lifestyle and behavior. Students will be able to identify the various parts of a fish; describe the concept of fish morphology; relate shape, form and structure of a fish's parts to function; and draw inferences about where and how fish might live based on its morphology.
Grade Level: 3-12
Go to: http://www.njmsc.org/Education/Lesson_Plans/Fish_Morphology.htm **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Get Your Quadrats in Gear

Source: Coral Reef Adventure Film
Lesson Summary: Students will construct and use a quadrat (a simple piece of scientific gear) to gather data about their environment.
Grade Level: 9-12
Go to: http://www.coralfilm.com/CRAEducatorGuide.pdf

The Good, the Bad and the Nasty Tasting

Source: NOAA Aquarius Undersea Laboratory
Lesson Summary: Students will be able to describe and explain chemical defense strategies used by many marine seaweeds and sessile invertebrates to protect them from predation, ward off disease, help defend living space, and reduce the impact of environmental stresses; describe and explain at least three ways in which chemicals produced by marine organisms can benefit humans and describe a first-hand experience that demonstrates how chemical defenses can be effective at deterring predators.
Grade Level: 9-12
Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20Good%20Bad%20Nasty.pdf

Keeping Watch on Corals

Source: NOAA NOS
Lesson Summary: Students will be able to identify and explain five ways that coral reefs benefit human beings; identify and explain three major threats to coral reefs; describe major components of the Coral Reef Early Warning System; identify and discuss actions that can be undertaken to reduce or eliminate threats to coral reefs; obtain and analyze several types of oceanographic data from remote-sensing satellites.
Grade Level: 9-12, adaptable to 6-8
Go to: http://oceanservice.noaa.gov/education/kits/corals/lessons/coral_mgmt.pdf or http://oceanservice.noaa.gov/education/kits/corals/supp_coral_lessons.html

Mapping the Ocean Floor

Source: New Jersey Marine Sciences Consortium
Lesson Summary: Students will be able to develop the understanding that the bottom structure of underwater habitats can be mapped; describe something they cannot see through the collection and correlation of accurate data and understand how technology can be applied as a tool for problem-solving. During this lesson, students participate in a simulation of the pre-sonar method of mapping underwater terrain.
Grade Level: 6-12

Go to: http://www.njmsc.org/Education/Lesson_Plans/Mapping_The_Ocean_Floor.htm **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Microfishing Lesson Plan

Source: Woods Hole Sea Education Association

Lesson Summary: Students use a simple method to collect living microorganisms from natural and/or artificial environments and develop skills in microscopy, observation, drawing, speculation, hypothesizing, oral presentation, and raising questions. This activity arouses curiosity and provides a fascinating look at a world we rarely get to see.

Grade Level: 6-12

Go to: http://www.sea.edu/academics/k12.asp?plan=microfishing

Ocean Careers Exploration

Source: Jean-Michel Cousteau Ocean Adventures

Lesson Summary: Students will gather information about the various careers of the members of the Ocean Adventure expedition team and learn about the strengths of having a team of diverse individuals working on a task.

Grade Level: 6-10

Go to: http://www.pbs.org/kqed/oceanadventures/educators/oceancareers/

Oxygen in Water

Source: New Jersey Marine Sciences Consortium

Lesson Summary: By sampling and testing a water sample, students will gain an understanding of dissolved oxygen and its importance to life in an aquatic ecosystem. Students will be able to use a test kit to determine the amount of dissolve oxygen in a water sample; determine if the dissolved oxygen level is reflective of a healthy system; and develop an understanding of how oxygen enters and exits water.

Grade Level: 6-12

Go to: http://www.njmsc.org/Education/Lesson_Plans/Oxygen_In_The_Water.htm **or** http://www.njmsc.org/Education/Lesson_Plans/Lesson_Plans.htm

Pipeline to the Coral Reef

Source: NOAA Aquarius Undersea Laboratory

Lesson Summary: How does upwelling affect nutrient availability to coral reefs? Students will be able to define and describe internal waves and explain their influence on coastal upwelling and analyze and discuss the effect of high nutrient concentrations caused by upwelling on the overall condition of Florida coral reefs.

Grade Level: 9-12

Go to: http://www.uncw.edu/aquarius/education/lessons/Aq%20Pipeline.pdf

Pretty Smart for a Hammerhead

Source: Shedd Aquarium

Lesson Summary: Sharks are often viewed as primitive fishes. Yet, they have highly developed senses — even one that allows them to locate prey by sensing its electricity! Students will be able to model how sharks locate prey by sensing electrical charges and describe the function of the ampullae of Lorenzini.

Grade Level: 6-9
Go to: http://www.sheddaquarium.org/sea/lesson_plans.cfm?id=32 or http://www.sheddaquarium.org/sea/search_results.cfm

Protecting the Reef is More Than Just a Game!

Source: Coral Reef Adventure Film
Lesson Summary: Students will understand that there are many actions, both positive and negative, that can affect the health of a coral reef.
Grade Level: 6-10
Go to: http://www.coralfilm.com/CRAEducatorGuide.pdf

Reefs at Risk

Source: Shedd Aquarium
Lesson Summary: Each plant and animal is integral to the balance of life on the coral reef. Find out what could happen if any of these organisms should disappear. Students will make a mobile to represent the food pyramid of the coral reef and consider the impact of human activities on individual species and on the reef as a whole.
Grade Level: 6-10
Go to: http://www.sheddaquarium.org/sea/lesson_plans.cfm?id=42 or http://www.sheddaquarium.org/sea/search_results.cfm

A Reef of Your Own

Source: NOAA NOS
Lesson Summary: Students will be able to describe and explain the importance of asexual and sexual reproductive strategies to reef-building corals; explain why it is important that reef-building corals have a nutritional strategy that includes both photosynthesis and carnivory; describe two behaviors that reef-building corals use to compete for living space with other species; explain how coral reefs can produce high levels of biological material when the waters surrounding these reefs contain relatively small amounts of the nutrients normally needed to support biological production.
Grade Level: 9-12, adaptable to 6-8
Go to: http://oceanservice.noaa.gov/education/classroom/lessons/01_reef.pdf or http://oceanservice.noaa.gov/education/kits/corals/supp_coral_lessons.html

Reef Partners Wanted

Source: Coral Reef Adventure Film
Lesson Summary: Students will identify several reef partnerships and describe how the organisms help each other.
Grade Level: 6-12
Go to: http://www.coralfilm.com/CRAEducatorGuide.pdf

Remote Sensing and Coral Reefs

Source: NOAA Satellite and Information Service
Lesson Summary: Coral reef and ocean curriculum that includes seven lessons on: Remote Sensing and the Electromagnetic Spectrum**,** Altimetry**,** Phytoplankton and Ocean Color**,**

Introduction to Coral Reefs, Symbiosis and Coral Anatomy**,** Sea Surface Temperature and Coral Bleaching, and Coral Reef Conservation.
Grade Level: 4-6, adaptable to 9-12
Go to: http://coralreefwatch.noaa.gov/satellite/education/reef_remote_sensing.html

Sea Connections

Source: Smithsonian
Lesson Summary: Students will be able to identify producers and consumers from four marine ecosystems; describe the delicate balance among organisms in each environment; construct a food chain or web from a marine ecosystem; and list some of the human activities that can upset the balance in marine environments.
Grade Level: 6-10
Go to: http://www.smithsonianeducation.org/educators/lesson_plans/ocean/connect/essay.html

The Silt and Sediment of It All

Source: Coral Reef Adventure Film
Lesson Summary: Students will build an underwater habitat to observe the effects that sediment and other environmental changes have on plant life growing in the habitat.
Grade Level: 9-12
Go to: http://www.coralfilm.com/CRAEducatorGuide.pdf

There are Lots of Fish in the Sea

Source: Shedd Aquarium
Lesson Summary: There are lots of fish in the sea — let's keep it that way! Many factors threaten the future of fish populations. Take part in a debate to look for solutions. Students will be able to identify threats to reef fish populations and debate solutions while considering multiple points of view.
Grade Level: 11-12
Go to: http://www.sheddaquarium.org/sea/lesson_plans.cfm?id=53 or http://www.sheddaquarium.org/sea/search_results.cfm

Threat Ranking

Source: PADI
Lesson Summary: Students will brainstorm to identify perceived local threats to coral reefs; select those which they feel they could realistically help reduce; and rank those selected threats from most severe to least severe. The threat ranking promotes small group discussion and helps to identify local priorities for community-based conservation solutions.
Grade Level: 6-12
Go to: SEFCRI Teacher Resource CD

Water Clarity

Source: Bermuda Biological Station for Research and the College of Exploration
Lesson Summary: Students will determine the relative clarity of different bodies of water and discuss why corals need clear water.

Grade Level: 6-10
Go to: http://www.coexploration.org/bbsr/coral/lessons/felice_1.html

Water Salinity

Source: Bermuda Biological Station for Research and the College of Exploration
Lesson Summary: Students will determine the salinity of different samples of water using a variety of methods and discuss how corals can tolerate some variation in the salinity of their environment.
Grade Level: 6-10
Go to: http://www.coexploration.org/bbsr/coral/lessons/felice_2.html

What if the Reef Dies?

Source: Bermuda Biological Station for Research and the College of Exploration
Lesson Summary: This lesson will provide opportunities to model, using simple laboratory materials, some aspects of reef ecology. In addition, student conclusions drawn from the activities will be referenced to known data. Finally, students will be asked to consider what they can do to insure reef survival.
Grade Level: 6-10
Go to: http://www.coexploration.org/bbsr/coral/lessons/gail_2.html

Where's the Salt?

Source: Bermuda Biological Station for Research and the College of Exploration
Lesson Summary: Students will show students how porous limestone filters saltwater.
Grade Level: 6-10
Go to: http://www.coexploration.org/bbsr/coral/lessons/felice_3.html

Who Has the Data?

Source: NOAA NOS
Lesson Summary: Students will be able to describe and explain the importance of asexual and sexual reproductive strategies to reef-building corals; explain the need for baseline data in coral reef monitoring programs; identify and explain five ways that coral reefs benefit human beings; identify and explain three major threats to coral reefs.
Grade Level: 9-12, adaptable to 6-8
Go to: http://oceanservice.noaa.gov/education/classroom/lessons/01_data.pdf or http://oceanservice.noaa.gov/education/kits/corals/supp_coral_lessons.html

Working as a Team

Source: Smithsonian Tropical Research Institute
Lesson Summary: Students will learn that interactions between organisms go beyond predator and prey.
Grade Level: 6-10
Go to: http://www.stri.org/english/visit_us/culebra/PDFs/lets_work_on_groups.pdf **or** http://www.stri.org/english/visit_us/culebra/education.php