



Mission: How does acidity impact corals?

Age: 8+

Time: 1 hour

Materials: \$15

(Set-up: 10 min | Activity: 45 min | Clean-up: 10 min)

NGSS Alignment of Coral Protection Activity

The information below may not include every area that this activity can be linked to NGSS concepts

Disciplinary Core Ideas

LS3.B: Inheritance of Traits

- **Grade 3**

- ◇ The environment also effects the traits that an organism develops.

LS1.A: Structure and Function

- **Grade 4**

- ◇ Plants and animals have both internal and external structures that serve various, functions in growth, survival, behavior, and reproduction.

ESS2.A: Earth Materials Systems

- **Grade 4**

- ◇ Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rock, soils, and sediments into smaller particles and move them around.

ESS2.E: Biogeology

- **Grade 4**

- ◇ Living things affect the physical characteristics of their regions.

ESS3.B: Natural Hazards

- **Grade 4**

- ◇ A variety of hazards result from natural processes. Humans cannot eliminate the hazards but can take steps to reduce their impacts.

- **Middle School**

- ◇ Mapping the history of natural hazards in a region, combined with an understanding of related geological forces can help forecast the locations and likelihoods of future events.

ESS3.C: Human Impacts on Earth

- **Middle School**

- ◇ Living things affect the physical characteristics of their regions.

ESS3.D: Global Climate Change

- **Middle School**

- ◇ Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature.



Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Grade 5
 - ◇ Measurements of a variety of properties can be used to identify materials.
- Middle School
 - ◇ Each pure substance has characteristic physical and chemical properties that can be used to identify it.

PS1.B: Chemical Reactions

- Grade 5
 - ◇ When two or more different substances are mixed, a new substance with different properties may be formed.
- Middle School
 - ◇ Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

ETS1.C: Optimizing the Design Solution

- Grade 3-5
 - ◇ Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.
- Middle School
 - ◇ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

LS2.A: Interdependent Relationships in Ecosystems

- Middle School
 - ◇ Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
 - ◇ In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproductions.
 - ◇ Growth of organisms and population increases are limited by access to resources.

LS3.C: Ecosystem Dynamics, Functioning, and Resilience

- Middle School
 - ◇ Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all populations.



Performance Expectations

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

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

4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

4-ESS3-2 Generate and compared multiple solutions to reduce the impacts of natural Earth processes on humans.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

5-PS1-3 Make observations and measurements to identify materials based on their properties.

5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

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-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-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on this environment.

MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Crosscutting Concepts:

Patterns

- Grade 3
 - ◇ Patterns of change can be used to make predictions.
- Middle School
 - ◇ Macroscopic patterns are related to the nature of microscopic and atomic-level structure
 - ◇ Graphs, charts, and images can be used to identify patterns in data.



Crosscutting Concepts:

Cause and Effect

- Grade 3-5
 - ◇ Cause and effect relationships are routinely identified, tested, and used to explain change.
- Middle School
 - ◇ Cause and effect relationships may be used to predict phenomena in natural or designed systems.
 - ◇ Relationships can be classified as casual or correlational, and correlation does not necessarily imply causation.

Scale, Proportions, and Quantity

- Grade 5
 - ◇ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Stability and Change

- Middle School
 - ◇ Small changes in one part of a system might cause large changes in another part.
 - ◇ Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

Influence of Science, Engineering and Technology on Society and the Natural World

- Grade 4
 - ◇ Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.
- Middle School
 - ◇ The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such facts as climate, natural resources, and economic conditions.

Engineering and Science Practices

Planning and Carrying Out Investigations

- Grade 3-5
 - ◇ Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
 - ◇ Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.



Engineering and Science Practices

Constructing Explanations and Designing Solutions

- Grade 3-5
 - ◇ Use evidence to support an explanation.
 - ◇ Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.
- Middle School
 - ◇ Apply scientific principles to design an object, tool, process or system.

Analyzing and Interpreting Data

- Middle School
 - ◇ Analyze and interpret data to provide evidence for phenomena.
 - ◇ Analyze and interpret data to determine similarities and differences in findings.

Developing and Using Models

- Middle School
 - ◇ Develop a model to predict and/or describe phenomena.

Asking Questions and Defining Problems

- Middle School
 - ◇ Ask questions to identify and clarify evidence of an argument.