

# LESSON 1

## What Makes a Healthy Marine Ecosystem?

### Lesson at a Glance

Through a video, the Internet, and the creation of a brainstorming web, students are introduced to marine ecosystems. By the end of this lesson students will be able to draw a healthy marine ecosystem with description of a threatened, protected, or endangered animal and explain why its habitat is important. The drawing will also include a description of the effects of natural events like storms, wind, waves, and tsunamis on these ecosystems.

### Lesson Duration

Two 45-minute periods

### Essential Question(s)

What makes a marine ecosystem healthy?

What are some natural events that impact marine ecosystems?

### Related HCPSIII Benchmark(s):

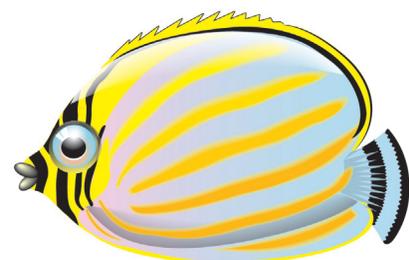
Science SC.4.3.2  
Describe how an organism's behavior is determined by its environment.

### Key Concepts

- A healthy marine ecosystem needs clean water, a variety of organisms and food sources, and a habitat that offers protection.
- Marine ecosystems are easily impacted by storms, wind, waves, and tsunamis.

### Instructional Objectives

- I *can* illustrate a healthy marine ecosystem with description of a threatened, protected, or endangered animal and an explanation of why its habitat is important.
- I *can* describe effects of natural events like storms, wind, waves, and tsunamis on marine ecosystems.



## Assessment Tools

### Benchmark Rubric:

Topic		Interdependence	
Benchmark <a href="#">SC.4.3.2</a>		Describe how an organism's behavior is determined by its environment	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Illustrate and explain in detail with examples how different organisms' behaviors are determined by their environment	Illustrate and explain with no examples how an organism's behavior is determined by its environment	Illustrate and give very little explanation of how an organism's behavior is influenced by its environment	Recognize that an organism's behavior is influenced by its environment through illustration only.

### Assessment/Evidence Pieces

#### Lesson

- Student illustration of a healthy marine ecosystem with description of a threatened, protected, or endangered animal and an explanation of why its habitat is important.

#### Unit

- Student Self-Assessment worksheet (pre-assessment)
  - NOTE: post-assessment can be given after the culminating lesson
  - This sheet can also be used to monitor student learning throughout the unit

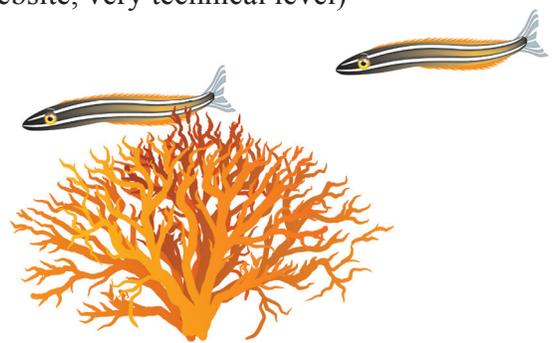
### Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> <li>• Browse websites below for images available for your island</li> <li>• Internet/computer access</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• White drawing paper</li> <li>• Sheet of folder paper for caption</li> <li>• Student Reading: <i>Natural Impacts</i></li> <li>• Copies of Student Self-Assessment worksheet</li> </ul>

#### Websites:

<http://www.soest.Hawaii.edu/coasts/data/index.html> (a good website, very technical level)

<http://www.hear.org/naturalareas/index.html>



## Instructional Resources

Teacher Reading: *Healthy Marine Ecosystems*

Student Reading: *Natural Impacts*

Student Worksheet: *What Are the Four Basic Impacts to a Marine Ecosystem?*

Assessment Tool: *Student Self-Reflection Monitoring Sheet*

Assessment Tool: *Teacher Resource Checklist-What Makes a Healthy Marine Ecosystem?*

## Student Vocabulary Words

**ecosystem:** the interaction of all plants, animals, bacteria and fungi together with their non-living physical environment.

## Lesson Plan

### Lesson Preparation

- Read the Science Background provided in the Unit’s Overview.
- Preview and make copies of Student Reading *Natural Impacts* and Student Worksheet *What Are the Four Basic Impacts to a Marine Ecosystem?*
- Select paper and drawing utensils (markers, colored pencils, or crayons).
- Arrange for students to have computer time in the library or computer lab.
- May use the student Self-Assessment worksheet “What makes a healthy marine ecosystem?” as a unit pre-assessment and a formative assessment throughout the unit.

### I. *Multimedia overview of unit*

- **Show the video about the National Marine Sanctuaries:** (use the higher speed for clarity) found at <http://www8.nos.noaa.gov/onms/Player/?ChapterID=167&ParkID=3>

### II. *A Healthy Marine Ecosystem*

- Tell students that they are going to learn more about what makes a healthy marine ecosystem. Create a web of marine ecosystems on chart paper. Ask students to brainstorm with you on the board. Ask students: What sorts of things might you find in a healthy marine ecosystem? Write their ideas on the board connected to marine ecosystem.
- Give students a moment to study all of the words that are associated with a marine ecosystem on the board.
- Discuss with students the few key elements of a healthy marine ecosystem:
  - Intact habitats that are not degraded or in other words, undamaged,
  - diversity of species,
  - clean, unpolluted water.
- Have students pick an animal that is threatened, protected or endangered and search on the Internet to find out where the animal lives and why that habitat is important to it. The following website has some great information on the National Marine Sanctuaries and the ecosystems and animals that they protect. It has sections on mammals, fish, birds, invertebrates, plants, and reptiles. Several have video of the species in their natural habitat. <http://www8.nos.noaa.gov/onms/Player/?ChapterID=167&ParkID=3>  
Have students choose a sanctuary in the upper right hand corner. Students can then choose an organism and watch a short video of the organism.
- You may want to use the following Monk Seal reading and explanation as a class example/model to the student-created habitat activity described below and built upon in subsequent lessons. Read the Monk Seal reading found on the defenders.org website listed below and discuss why this habitat is important to its survival. [http://www.defenders.org/wildlife\\_and\\_habitat/wildlife/Hawaiian\\_monk\\_seal.php](http://www.defenders.org/wildlife_and_habitat/wildlife/Hawaiian_monk_seal.php)  
<http://www8.nos.noaa.gov/onms/Player/?ChapterID=167&ParkID=3> (this video has no narration but shows the monk seal in an unpolluted habitat.)
- Have students use plain paper to draw a healthy marine ecosystem using one pen/pencil color. Have students label the elements needed by their organism to survive. [This drawing will be used and built upon in upcoming lessons]
- Teacher may want to have students develop class criteria for what should be in each drawing and description. Students may want/need to update these criteria as they complete their illustrations.

- H. On the backside of the student’s drawing or on a separate sheet of paper have them name the threatened, protected or endangered animal and explain why this habitat is important. The following prompt may be used to help students with their explanation.
- Name your animal
  - Why is your animal’s habitat important to your animal?

\*Note: Students may need extra time to explore the website(s) and choose their organism.

### III. *Natural Impacts*

- A. Give students copies of Student Reading *Natural Impacts*, give time for them to read and annotate the article. From the Student Reading, write the *natural events that impact marine ecosystems* on the board.

o Some annotation suggestions:

- Have students identify key words and circle them
- Have students write down any questions/wonderings that they think of while reading *Natural Impacts*
- Have students identify and define unfamiliar words

- B. Have students complete the “*What are the Four Basic Natural Impacts?*” worksheet (this can be copied onto the back of the student reading)

- C. Show students images of natural impacts on their island, if available, to prompt their thinking about natural events. You may have to show images of a neighbor island in some instances. The following links have some of these images:

1. Images of erosion which can be caused by wind and waves:

<http://www.soest.Hawaii.edu/asp/coasts/oahu/ground.asp> this site has ground photos depicting erosion on *O’ahu*, *Maui*, and *Kaua’i*. Click on the tab marked with your island and then click on the area on the island you wish to see. For the Big Island, try the following site:

<http://geomaps.wr.usgs.gov/parks/coast/sand/index.html>

It is a close look at the Green Sand Beach with some pictures of erosion.

<http://www.hear.org/naturalareas/index.html>

or for their island to prompt their thinking about natural events or use

[http://www.hear.org/hoike/pdfs/coastal\\_unit1\\_act3.pdf](http://www.hear.org/hoike/pdfs/coastal_unit1_act3.pdf)

2. Images of storm impacts: Hurricane impact images on *Kaua’i* and the island of Hawai‘i can be found at [http://www.uhh.Hawaii.edu/~nat\\_haz/hurricanes/gallery.php](http://www.uhh.Hawaii.edu/~nat_haz/hurricanes/gallery.php)

The page below has images of the Big Island in the flood of 2000:

[http://www.uhh.Hawaii.edu/~nat\\_haz/floods/gallery.php](http://www.uhh.Hawaii.edu/~nat_haz/floods/gallery.php)

3. Images of tsunami impacts: This site has many images of the Big Island after and during tsunamis: [http://www.uhh.Hawaii.edu/~nat\\_haz/tsunamis/gallery.php](http://www.uhh.Hawaii.edu/~nat_haz/tsunamis/gallery.php)

While presenting the images, ask questions like, “*What sorts of natural events might impact this landscape?*” Ask students to keep their ideas handy for the next step.

- D. Have the students write a response to: How might these natural events impact the marine ecosystem? [Suggestion: This may be done as an Exit Pass or as a homework assignment.]

### IV. *Check for understanding*

Return to the chart from part II. Review with students the elements of a healthy marine ecosystem. Discuss how these are impacted by natural events. To provide formative data, write student ideas on chart paper, and keep them available for the remainder of the unit.

# LESSON 1

## Teacher Reading

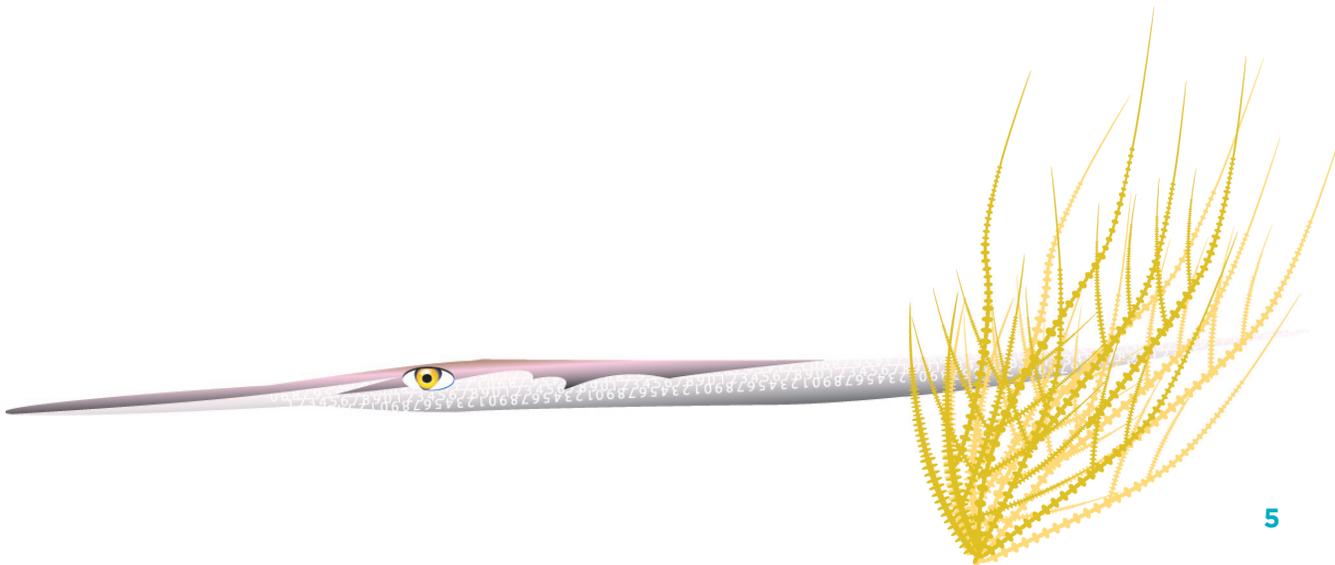
### Healthy Marine Ecosystems

Marine ecosystems are part of a diverse group of aquatic ecosystems. Marine ecosystems cover a large portion of Earth's surface and include oceans, estuaries, salt marshes, lagoons, rocky intertidal zones, and subtidal habitats. A healthy marine ecosystem needs diversity of life, clean water, and habitat that offers protection.

1. Healthy marine ecosystems need habitat space. For example, beach habitats struggle against erosion of the beach. Beaches in Hawai'i are eroding due to coastal development and shoreline barriers like sea walls and jetties. Approximately 25% of the beaches on *O'ahu* have lost significant amounts of sand due to erosion from manmade barriers and development. Loss of sand also means loss of habitat.
2. Healthy marine ecosystems include a diversity of organisms from small species, such as plankton, to much larger species of fish, turtles, and whales.
3. Healthy marine ecosystems should be clean and free of pollutants. Trash or marine debris can harm marine organisms. Chemicals or sediments in the water can decrease the amounts of oxygen available for marine organism to survive, reduce sun light penetration into the water, and even poison marine organisms.

For more details read the science background at the beginning of this unit.

Sources: <http://www.epa.gov/bioindicators/aquatic/marine.html>  
<http://www.soest.Hawaii.edu/SEAGRANT/CEaBLiH.html>



# LESSON 1 Student Reading

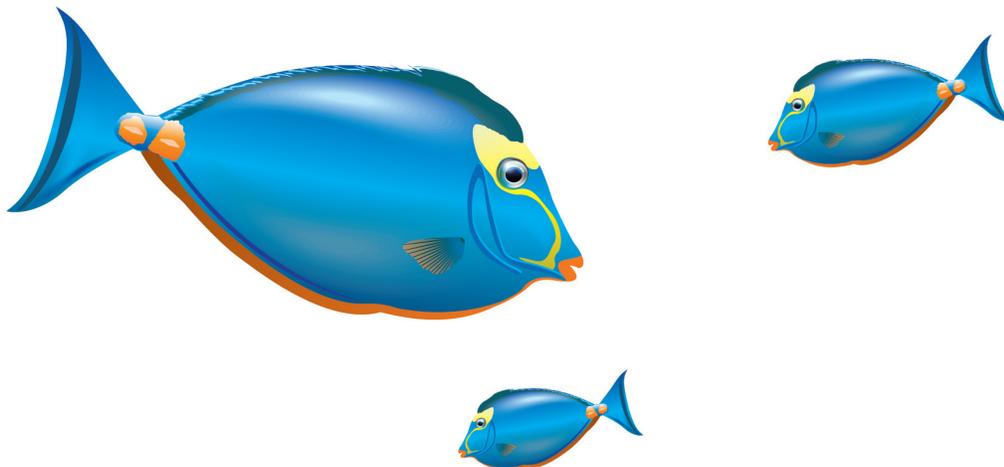
## Natural Impacts

Marine ecosystems change constantly. A *natural* event is one that is not caused by humans, but changes the landscape in some way. Wind, waves, storms, and tsunamis are all natural events that can have a great impact on marine ecosystems and cause them to change.

Winds and waves shape the marine ecosystem through processes of erosion, for example, on a sandy beach, wind and waves transport sand over time.

Storms generate large amounts of wind, rain, and waves. Rain can affect the salinity of certain shallow habitats; wind and waves can create currents that displace sand, corals and other attached organisms.

Tsunamis are rare events involving enormous waves triggered by offshore underwater earthquakes. Tsunamis can greatly alter marine habitat and displace animals and plants in marine ecosystems.



# LESSON 1 Student Worksheet

## What are the Four Basic Natural Impacts to a Marine Ecosystem?

Fill in the blanks to identify each natural impact. Below the word, describe what impact it has on the ecosystem.

1. \_\_\_\_\_  
\_\_\_\_\_ **w** \_\_\_\_\_

Impact:

2. \_\_\_\_\_  
\_\_\_\_\_ **v** \_\_\_\_\_

Impact:

3. \_\_\_\_\_  
\_\_\_\_\_ **s** \_\_\_\_\_ **m** \_\_\_\_\_

Impact 1:

Impact 2:

4. \_\_\_\_\_  
\_\_\_\_\_ **u** \_\_\_\_\_ \_\_\_\_\_ **s** \_\_\_\_\_

Impact:

Worksheet used with permission from Laurie Ines

NAME: \_\_\_\_\_

## Student Self- Reflection: Monitoring Sheet

Pre-Assessment

	Wow!	Yes!	Almost	Not Yet	Comments
I can identify key elements that are needed in a healthy ecosystem.					
I can identify what impacts humans have on a healthy ecosystem.					
I can explain ways to protect marine ecosystems.					
I understand what a Marine Protected Area is.					

After Lesson #1

Date: \_\_\_\_\_

	Wow!	Yes!	Almost	Not Yet	Comments
I can identify what things are needed in a healthy ecosystem.					
I can identify what impacts humans have on a healthy ecosystem.					
I can explain ways to protect marine ecosystems.					
I understand what a Marine Protected Area is.					

After Lesson #2

Date: \_\_\_\_\_

	Wow!	Yes!	Almost	Not Yet	Comments
I can identify what things are needed in a healthy ecosystem.					
I can identify what impacts humans have on a healthy ecosystem.					
I can explain ways to protect marine ecosystems.					
I understand what a Marine Protected Area is.					

After Lesson #3

Date:

	Wow!	Yes!	Almost	Not Yet	Comments
I can identify what things are needed in a healthy ecosystem.					
I can identify what impacts humans have on a healthy ecosystem.					
I can explain ways to protect marine ecosystems.					
I understand what a Marine Protected Area is.					

After Lesson #4

Date:

	Wow!	Yes!	Almost	Not Yet	Comments
I can identify what things are needed in a healthy ecosystem.					
I can identify what impacts humans have on a healthy ecosystem.					
I can explain ways to protect marine ecosystems.					
I understand what a Marine Protected Area is.					

Post-Assessment (After Culminating Lesson)

Date:

	Wow!	Yes!	Almost	Not Yet	Comments
I can identify what things are needed in a healthy ecosystem.					
I can identify what impacts humans have on a healthy ecosystem.					
I can explain ways to protect marine ecosystems.					
I understand what a Marine Protected Area is.					

# LESSON 1 Teacher Resource Checklist

## What Makes a Healthy Marine Ecosystem?

Name	<i>Identifies elements of a healthy ecosystem (discussion)</i>			<i>Natural Impacts (worksheet) Identifies the natural impact and its effect on environment</i>
	<i>Undamaged</i>	<i>Diversity of species</i>	<i>Clean, unpolluted water</i>	
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