Shore to Sea Floor Lab

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Name _____

Date _____

Period _____



Do Now These tuna swim in the open ocean near Hawaii, close to the surface where sunlight reaches. The water below them is about 4,700 meters deep. That is almost 3 miles. 2 minutes, before you open the lab

A. Predict: how deep can the sunlight go before it is almost all gone?

☐ About 10 meters ☐ About 200 meters ☐ All the way to the bottom

B. Plants and algae need sunlight to make food. What do you think animals eat in the dark water far below?

_____

☐ I can use real ocean data to describe the open sea's three zones.

☐ I can explain why most ocean life is in the coastal zone.

☐ I can name the services a coastal ecosystem gives people, and use numbers to argue for keeping it.

Part 1. Dive down (Tab 1)

SEP 4 Analyzing and Interpreting Data · CCC Scale, Proportion, and Quantity

Pick each depth: **0**, **100**, **200**, **1,000** and **4,000** m. Press **Record** at each one. Copy your dive log.

1. Your dive log, near Hawaii.

Depth	Light (% of the surface)	Temperature (°C)	Pressure (atm)
0 m			
100 m			
200 m			
1,000 m			
4,000 m			

2. The light is almost all gone by about

☐ 10 m ☐ 200 m ☐ the sea floor

3. The pressure at 4,000 m is about _____ times the pressure at the surface.

The water at 4,000 m is _____ °C colder than at the surface.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 4 to 6.

4. The _____ zone is bright, the _____ zone is dim, and the _____ zone is dark. Only the _____ zone has enough light for photosynthesis.

5. Which zone does each one live in? Tick one box in each row.

What the probe saw	Zone
A sea cucumber eats dead bits on the cold, dark floor at 4,000 m	☐ euphotic ☐ bathyal ☐ abyssal
Phytoplankton drift and make food from sunlight	☐ euphotic ☐ bathyal ☐ abyssal
Lanternfish with big eyes hunt in dim light at 500 m	☐ euphotic ☐ bathyal ☐ abyssal

6. No plants or algae grow at 4,000 m. Where does the food for the animals there come from?

Part 2. Coast or open sea (Tab 2)

SEP 4 Analyzing and Interpreting Data · CCC Patterns

Tap all seven letters on the map, **A** to **G**. Copy each one from **Your site log**. Then press **Show the names**.

7. Chlorophyll is the green coloring in tiny algae. More chlorophyll means more algae.

Site	A	B	C	D	E	F	G
Chlorophyll (mg/m³)							
Sea floor depth (m)							

8. The sites with more than 1 mg/m³ of chlorophyll all have a sea floor

☐ less than 100 m deep ☐ more than 3,000 m deep

Site A has about _____ times as much chlorophyll as site C. (Divide A by C.)

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 9 to 11.

9. The coastal zone runs from the high-tide line out to the edge of the continental _____. It has more algae because _____ reaches much of the water and rivers bring _____ from the land.

10. What kind of ecosystem is each site? Tick one box in each row.

Site	Ecosystem
B: Monterey Bay	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
G: Sapelo Sound	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
A: Lower New York Bay	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
F: The Sargasso Sea	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
D: The Sundarbans	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea

11. Site A is an estuary. Its water is **brackish** , a mix of _____ water and _____ water. Name two services coastal ecosystems give people: _____ and _____

Part 3. Roots against waves (Tab 3)

SEP 3 Investigations · SEP 5 Mathematics · CCC Structure and Function

Pick **Young and thin**. Set the width to **0**, **100**, **200** and **500** m, and press **Send the storm waves** each time. Then do the same with **Old and dense**.

12. Plan check. What job does each one have? Tick one box in each row.

In this test	Job
Height of the waves at the houses	☐ changed ☐ measured ☐ kept the same
Width of the forest	☐ changed ☐ measured ☐ kept the same
Height of the storm waves coming in	☐ changed ☐ measured ☐ kept the same

13. Waves at the houses (cm).

Forest width	Young and thin	Old and dense
0 m		
100 m		
200 m		
500 m		

14. Old and dense, 200 m wide: the waves got (100 – _____) ÷ 100 × 100 = _____ % smaller.

In the old forest, the first 100 m cut the waves by _____ cm. The next 100 m cut them by _____ cm.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 15 to 17.

15. The mangrove's many thin _____ each take some of the wave's _____, so the wave gets _____ as it moves through the forest.

16. Model check. This lab is a model. Name one thing about a real coast or a real storm that it leaves out.

17. Besides slowing waves, mangroves give two more services: _____ and _____

Wrap it up

SEP 7 Engaging in Argument from Evidence · CCC Stability and Change

18. A town says: "Clear 200 m of old, dense mangroves and build houses with an ocean view. A seawall will do the same job." Do you agree? Make a claim. Use two numbers from this lab and one service a seawall cannot give.

NYSSLS: building toward HS-ESS2-5 and HS-ESS2-7 (DCI ESS2.C, ESS2.E). Environmental Science, Chapter 6, Lesson 6.3: What Are the Major Types of Marine Ecosystems? (pp. 180-185). SEP = Science and Engineering Practice, CCC = Crosscutting Concept. Data: World Ocean Atlas 2023 (NOAA), NASA Aqua MODIS chlorophyll 2021 (NOAA CoastWatch), McIvor and others (2012), Narayan and others (2025).