Name: _____

Coastal edition

Getting the Day Started

Take a minute to look around and then record how the land surrounding this beach is used. Are there houses, buildings, stores, fields, roads, parks, etc.? List all that apply.

_____
_____
_____
_____

Think back to the discussion on ocean health. Are any of the types of pollution we discussed present here? If so which ones? Besides each type of pollution, list whether it is a point-source or non-point source of pollution.

_____
_____

Time to make a Hypothesis!

Before you take your samples, make a hypothesis about the overall health of this beach. Do you think it will be good or bad? **Example:** If there is a lot of pollution on the beach then the overall health will be bad. If there is _____ then the overall health of the beach will be _____.
How did you come to this hypothesis? Your answers can be in point form.

Vocabulary

These are some of the words you will need to know during your field day:

Erosion	The process by which the surface of the Earth is worn away by natural elements such as water, wind, and glacial ice
High Tide Zone	Area of beach that is covered only during very high tides.
Intertidal Zone	Area of beach covered by water at high tide and exposed at low tide.
Low Tide Zone	Area of beach that is only exposed at very low tides.
Quadrat	A quadrat is a frame, generally square in shape, used in ecology and geography to isolate a standard unit of area for study of the distribution of an item over a large area.
Splash Zone	Area of beach that is usually dry but gets splashed by waves or during storms.
Subtidal Zone	Area of beach that is always under water.
Transect	Transects are used by scientists to determine where organisms are found, how common they are, and how often they occur within an area

Beach Profile

What is a beach profile? A beach profile is the measurement of the change in height of the beach taken along a transect line that runs from the high water mark to the low water mark.

Why do we study beach profiles? Beach profiles are useful in studying the effects of waves, currents, storms and human structures on a beach. Through beach profiling we can determine how vulnerable the coast is to natural and human impacts and determine what can be done to prevent further damage.

Do beach profiles look at the abiotic features or biotic features of a beach? Explain.

_____

_____

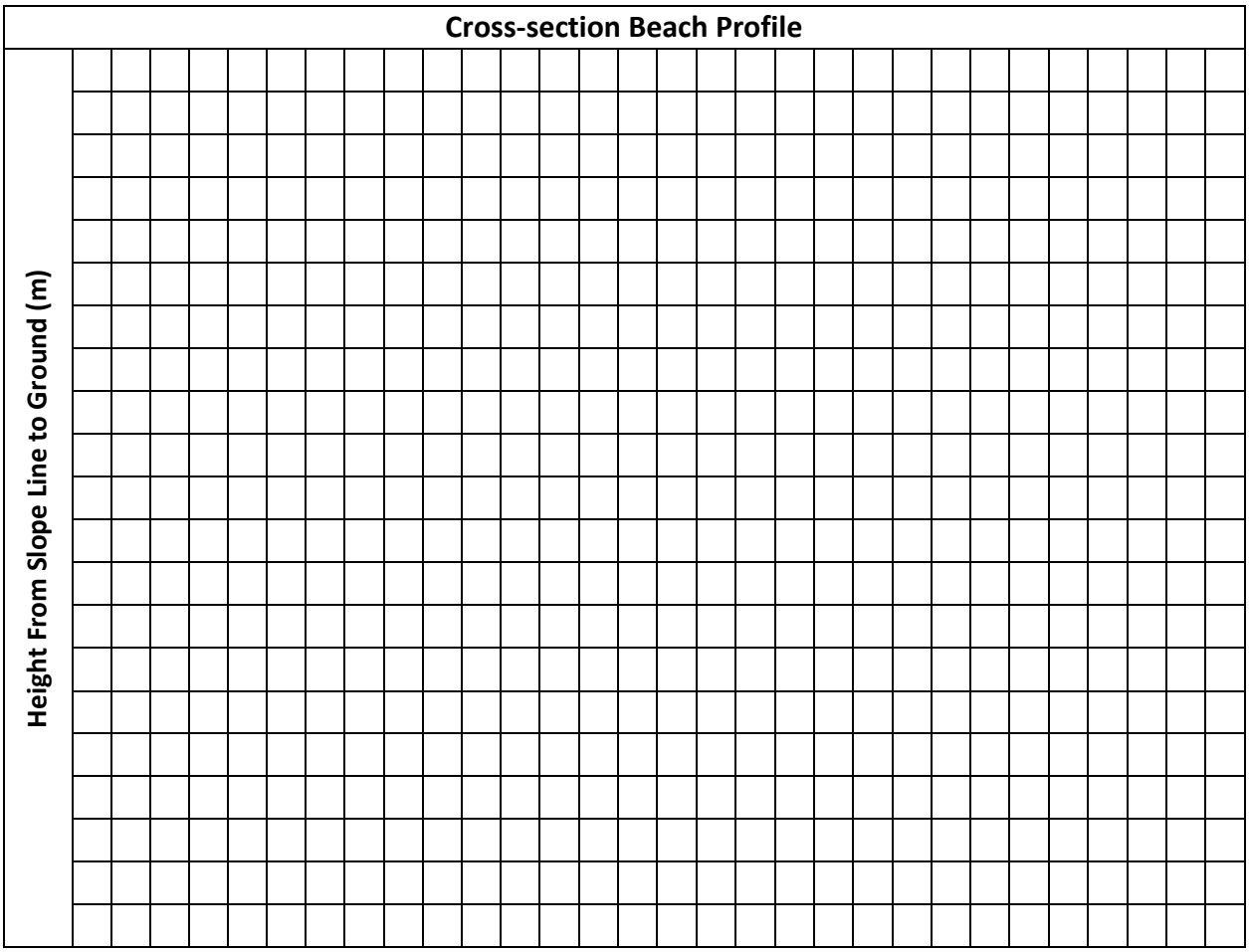
Beach Profile Data:

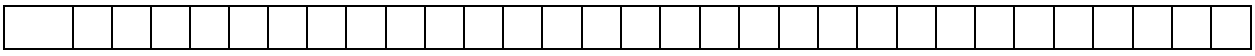
1. To begin find a point above the splash zone where you can tie your string to.
2. Tie the other end of string off at ground level at the water's edge.
3. Using a clinometer measure the slope of the beach by lining up the clinometer with the string. Moving your way up to the splash zone, at every 3-5m, measure the height from the string to the ground using the plumb bob.
4. At each stop measure the ground temperature.
5. Complete the chart.

Transect _____			**Time of Low Tide: _____ am/pm**	
GPS coordinates **Lat:**			**Weather Conditions:**	
Point #	**Distance**	**Height**	**Temperature**	**Observations** (Describe the area; sun, shade, type of substrate)
1				

(Water's edge)	0	0		

Cross-section Beach Profile Sketch: Using the points collected in the beach profile data chart create a cross-section of the beach profile on the graph paper below. Plot the ordered pairs (Distance, Height) on the graph paper and connect the dots creating a rough sketch of the beach profile. Draw the string line on the graph as well.





Distance from Water's Edge to High Water Mark (m)

Fun Fact: The substrate of beaches is often made up of different materials such as sand, pebbles, rocks and seashell fragments!

Tip: *The string line on the graph should be a straight line! This will tell you the overall slope of the beach!*

Zonation Analysis

What is zonation? Zonation is the change in organisms caused by differences in both biotic and abiotic conditions within a specific environment.

Make a hypothesis: What abiotic factor do you think is the most important in determining where species live on the beach? Explain.

_____

_____

Zonation Analysis: Now that you know what the beach profile looks like it is now time to pay closer attention to the species that live there!

1. Return to your original transect line and place the quadrat at each measurement point.
2. Starting at the water's edge look at what is found in each quadrat.
3. Pay close attention to both abiotic and biotic factors!
4. Record the information in the chart below.

Biotic Factors	Abiotic Factors

Species Abundance: Choose 4 different species found within your quadrat and count the abundance of each species. Record the abundance in the Species Abundance Student Chart.

From the data collected in the Species Abundance Chart create a Kite Diagram.

Species Abundance Student Chart

Species Name					
Quadrat	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				

How to Create a Kite Diagram:

- Using the data from the Species abundance chart plat the values on the Kite Diagram below.
- Looking at the first species find the highest density value. Divide it in half.
- At the corresponding distance point plot half of the density value above the baseline and half below.
- Complete for all density values.
- Connect the dots and shade in the kite formation! You will have 4 separate kite formations.

Kite Diagram:

Species 1	
Species 2	
Species 3	

Species 4	

Distance From the Water's Edge

How does species abundance change as you move away from the water?

_____

_____

What abiotic factors impact species distribution the most?

_____

_____

Are there any species that are always found together? Never found together?

_____

_____

Beach Erosion

What is erosion? The process by which rocks and sediment are worn away by water, wind, and ice.

What factors impact the rate of erosion on a coastal zone? Type of substrate, level of exposure to wind and waves, storms and human development can impact rate of erosion.

Hypothesize which season would have the most erosion. Circle the season and explain why!

In the (**winter, spring, summer, autumn**) there is more erosion because the ocean (**is calm, has more waves, is warmer, is colder**).

Beach Erosion: Go to your transect line and observe the abiotic features along the beach. Record your findings.

Describe the main type of substrate on the beach:

_____

Fill in the chart to determine if erosion on the beach is high, medium or low. Shade in the box that sounds most like what you see along your shoreline and then use this information to determine the overall level of erosion. (Hint: Where is most of your shading?!)

Feature of Erosion	Low Level of Erosion	Medium Level of Erosion	High Level of Erosion
Type of Substrate	Only has large substrate (large rocks).	Mixture of rocks and sand.	Only has fine and course gain sand.
Intertidal Zone	Lots of vegetation along the shoreline (marine plants).	Some vegetation along the shoreline.	Little to no vegetation along the shoreline. Limited amount of

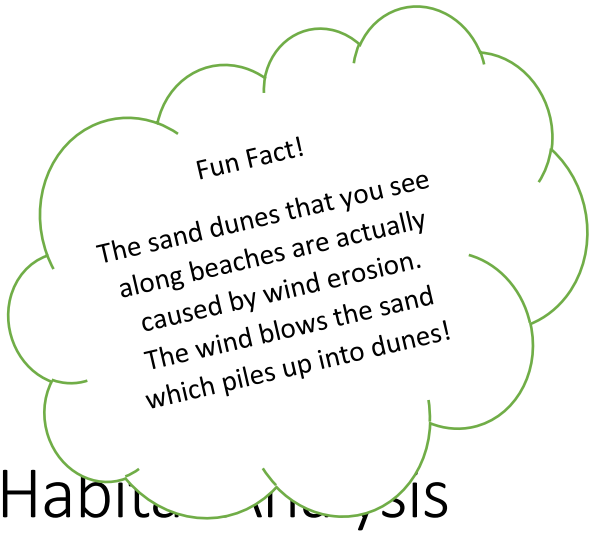
	Mix of grass and plants in the splash zone. There is very little human development.	Some plants and tress in the splash zone. Some human development not along shoreline.	grass and plants in the splash zone. High levels of development near the shoreline.
Wave Action	Low level of wave action. No large or crashing waves.	Some small waves. Very few crashing waves on the shore.	High level of wave action. Waves are medium to large and frequently crash on shore.
Level of Protection	The area is protected from wave and wind action.	The area is exposed to some wave and wind action.	The area has a high level of wave and wind action. Area is exposed to open ocean.

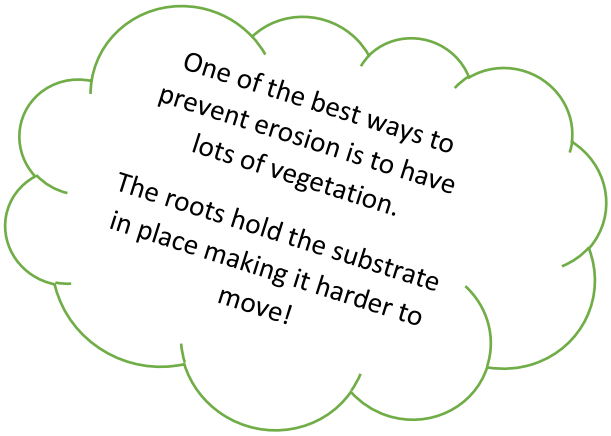
Based on the features of erosion chart, what level of erosion is your area subjected to? Explain.

Look at the beach profile map with the added human structures. List any human made features in the area:

Are there structures that are at risk of damage from erosion?

Think about your hypothesis! During what season do you think erosion would have the greatest impact; winter months or summer months? Explain!





Habitat Analysis

What is a habitat? The type of natural environment where specific organisms live.

How is the intertidal zone habitat unique? The intertidal zone is covered by water at high tide but not at low tide! Organisms that live there must be able to withstand changing conditions including wave action, currents and drying out!

How do abiotic factors impact biotic factors in an ecosystem?

_____

_____

Abiotic Components:

What zone of the beach is your quadrat placed in? _____

Estimate what percentage of the quadrat is covered by biotic features: _____% abiotic features: _____%

1. Place a quadrat in an area on the beach (try to move away from other groups!).
2. Look at the biotic and abiotic components found within the quadrat.
3. Record the temperature and type of substrate found within the quadrat.
4. Complete the Abiotic Components section of the Habitat Analysis chart.

Habitat Analysis Chart:

Abiotic Components	
Temperature Readings	Surface of Substrate: (Rock, sand, mud)
	2cm under ground/water:
	Temperature in vegetation:

	(If applicable)			
Substrate Conditions	**Vegetation Present**	Yes		No
	Type of substrate	Mud	Rock	Sand
	Topography	Flat	Gentle Slope	Steep Slope
	Colour	Light	Medium	Dark
	Texture **Which one is there most of?**	Fine Grains	Medium Grains	Course/large grains
Sketch the area:				

Biotic Components:

Pay close attention to the biotic features within the quadrat. Do you see any organisms? Look around for the biotic components. Carefully move items and turn over rocks. What are the organisms doing? Find 3 different organisms and complete the organism identification chart. Using the species identification guide find the name of the species!

Organism Identification Chart:

Organism Name	**Describe the organism**	**Sketch the organism**
Species 1 Name: _____	Colour of the organism:	
	Measurement: Length of organism (cm):	
	Mechanism for protection? (Shell, spines, camouflage)	
	Locomotion: How does the organism move?	Where was the organism found in the quadrat? (Under rocks, in mud, etc.,)
	Describe the organism	**Sketch the organism**
	Colour of the organism:	

Species 2 Name: _____		
	Measurement: Length of organism (cm):	
	Mechanism for protection? (Shell, spines, camouflage)	
	Locomotion: How does the organism move?	Where was the organism found in the quadrat? (Under rocks, in mud, etc.,)
Species 3 Name: _____	**Describe the Organism**	**Sketch the organism**
	Colour of the organism:	
	Measurement: Length of organism (cm):	
	Mechanism for protection? (Shell, spines, camouflage)	
	Locomotion: How does the organism move?	Where was the organism found in the quadrat? (Under rocks, in mud, etc.,)

What abiotic factors have the most influence on where species are found?

_____

_____

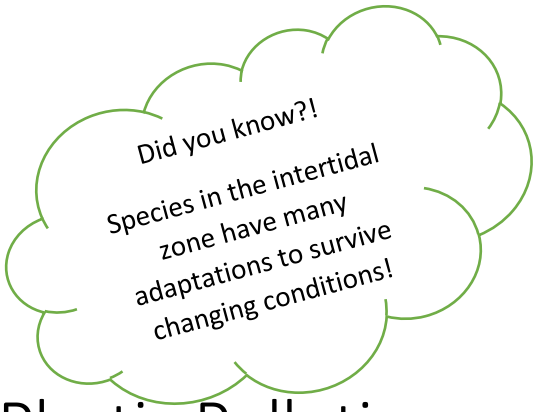
As you move away from the shoreline what adaptations do species need to have in order to survive?

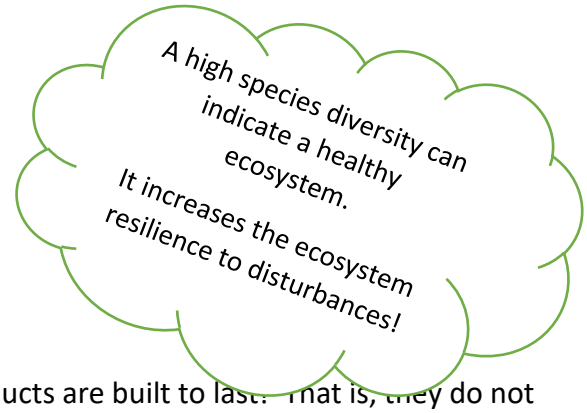
_____

_____

Find another group to share information with! Locate another group with a quadrat either closer to the water or further away from the water than your group location. Using combined information identify which species would be more tolerant to changing conditions (temperature, salinity, drying out, waves). Hint: Use your beach map with the labeled zones!

_____
_____
_____





Plastic Pollution

Why is plastic bad for the environment? Plastic products are built to last. That is, they do not biodegrade (cannot be broken down by living organisms) so they stay in the environment forever. In addition, many marine organisms, including sea birds and turtles, mistake the plastic pieces for food or can become entangled or trapped by plastic products.

What are the most common forms of plastics that you see on the beach?

_____
_____

Plastic Pollution:

1. Return to your original transect line in your group. Take out the cross sectional sketch of the beach profile from the first activity.
2. Place an "X" in each of the corners. Place a piece of acetate over top of the beach map and secure it in place with binder clips. Trace the four X's on to the acetate so that you can realign the acetate later.
3. Draw all pieces of plastic you see on the map overlay. Measure each piece with a ruler.
4. Describe the size, colour, and give a short description (Is it old? Worn down? A whole product?)
5. Once you have drawn all pieces of plastic on the map complete the plastic pollution chart.

Plastic Pollution Chart:

Plastic	Size (cm)	Colour	Description

Clean up the beach! Grab a trash bag and pick up the plastics in your area!!

How long do you think that these plastics have been here?

_____

Where do you think that the plastic has come from?

_____

Final Conclusions

Why is it important to do both abiotic and biotic sampling to determine the overall health of the beach ecosystem? Which do you think is a better indicator of ecosystem health?

_____
_____
_____

Compare your results to your original hypothesis. Is the health of this beach what you expected it to be? What surprised you?

_____
_____

List all factors that contribute to a healthy beach ecosystem. Include both positive and negative points.

_____
_____
_____
_____
_____
_____

Community Action Project!

The next part of the Clean Water School Coastal Edition is to do a community action project. Now that you know the impact of plastic and pollution on our beaches and oceans, what type of action or next steps do you think would be good for this beach?

_____

_____

Fill out the chart below. For each issue list the stakeholders involved and provide an idea for a solution:

What are the issues at this beach?	Who are the stakeholders involved?	What can we do about this issue? How could we educate people about it?