



CONNECT | ENRICH | TRANSFORM

Features of the Ocean Floor

Introduction:

Underneath the surface of Earth's ocean lie dramatic landscapes including lofty peaks, wide plains, and deep valleys. Mid-ocean ridges form the largest mountain chain on the planet, deep trenches reach almost 7 miles deep, and vast underwater plains cover almost half the planet's surface. Needless to say, Earth's ocean floor is full of geological features, and we can now explore them using Google Earth's ocean exploration tool, "The World's Ocean". For this activity, we will explore the oceans in search of various landscapes and mark their GPS locations for other students to find as well to illustrate the features and surrounding landscapes.

Throughout history humans have been drawn to the ocean in search of new discoveries. A lot has changed over the years, scientific advances have allowed us to peer deeper into the unknown. Nowadays, we can use satellite imagery, submersible sonars, remotely operated vehicles, and so many other tools to explore the ocean, even from the comforts of dry land! Luckily for us modern day oceanic explorers there are still plenty of discoveries waiting to be found. In fact, we have only explored 5% of the entire ocean to date. Some 30,000 years ago humans began to leave their coastlines on rafts, exploring the ocean only by means of eyesight and breath-holding. It wasn't until 1925 that scientists began using sonar to map the ocean floor. In 1943, underwater explorers developed the first modern scuba systems. In the 1950's we discovered the deepest part of the ocean, the Challenger Deep, as well as identified the Mid-Atlantic ridge stretching for 40,000 nautical miles. In the 1970's hydrothermal vents were found to contain an abundance of life never before thought possible at the depths they were located, and in 1995 humans finally began mapping the ocean floor from space. Even recently, in 2012, the first solo dive exploration to the Challenger Deep was conducted by James Cameron, but he was only able to stay down for 3 hours.

Many of the ocean features we will find are the product of tectonic plate activity. Tectonic plates are pieces of Earth's crust and uppermost mantle that slide over, below, and against one another causing major geological formations. Not only do the collisions create colossal formations such as mid-ocean ridges, but they also expose molten lava that is right below the tectonic plates. As these openings form, lava is released creating features such as volcanoes. Over time, these features grow to such heights that they are exposed above sea level and are subject to the forces of wind, rain, and erosion.

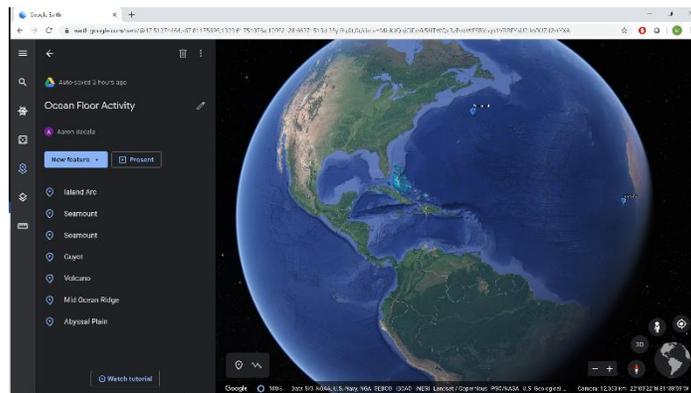
Needless to say, there is still plenty in the ocean for us to find and learn about. As science continues to advance so will our ability to explore more of the Earth's ocean. The World's Ocean tool via Google, created in 2009, will allow us a unique opportunity to explore the ocean in a way our oceanographic ancestors could only have dreamed of.

What you will need:

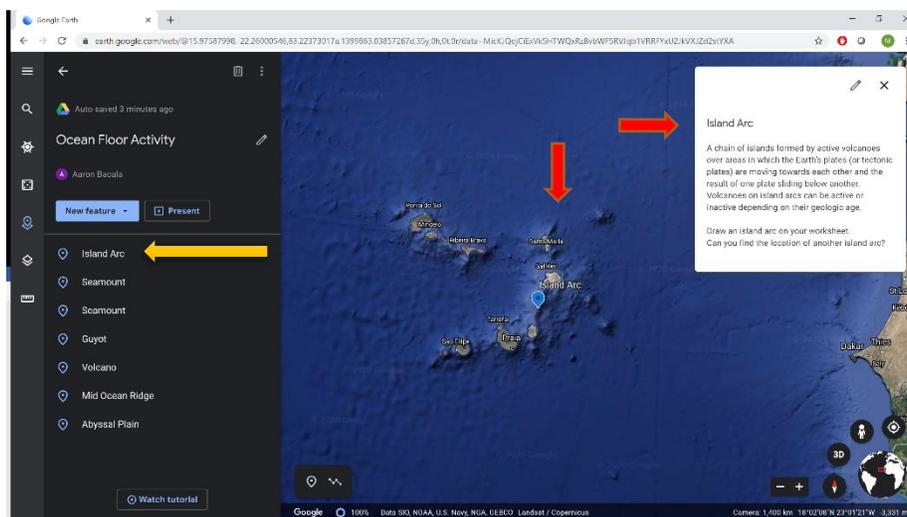
- A computer or other device with internet access
- Google Chrome (no other web browser will work)
- Printed copy of the drawing pages (pages 4-7) and the data table (page 8)
- Something to write with
- Something to draw with (you may want multiple colors, but that is optional)
- An ocean explorer's sense of adventure

How to get started:

1. If you do not have google chrome on your device you will need to download it. If you already have Google Chrome you can skip this step.
2. Use [this link](https://drive.google.com/open?id=1VNGMd1G0omayERjoUQDV1SbdUrYwk-ap&usp=sharing) to go to the World's Ocean Tool in Google Earth.
 - If the hyperlink does not work please cut and paste the link below in to Google Chrome.
<https://drive.google.com/open?id=1VNGMd1G0omayERjoUQDV1SbdUrYwk-ap&usp=sharing>
3. Once Google Earth launches you should see an image of the earth and the Ocean Floor Activity project window.

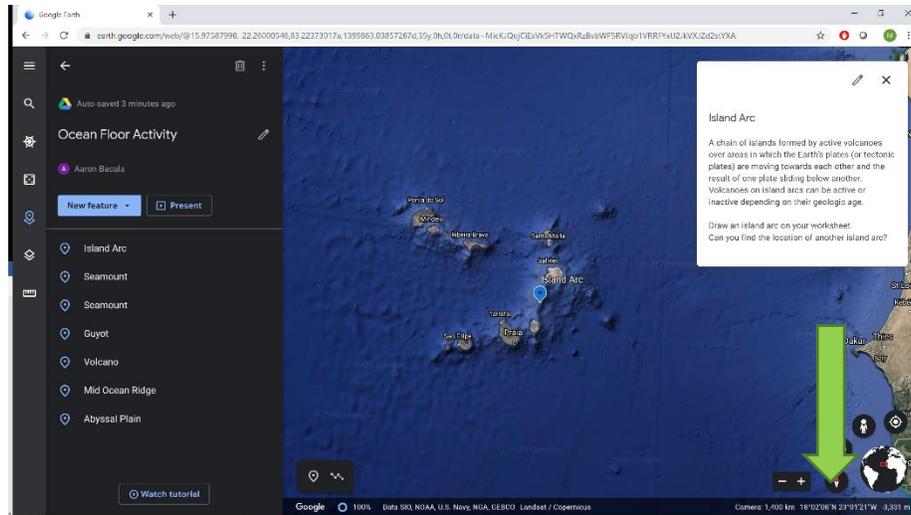


4. Click on Island Arc in the project window (see the yellow arrow). This should take you to the location of an example of an island arc and give you a pop-up window (see the red arrows).



5. In the place indicated on worksheet draw an island arc like the example in Google Earth.

- Under your drawing write the GPS coordinates of the island arc you have been shown. These coordinates can be found in the lower right-hand corner of the screen (See the green arrow).



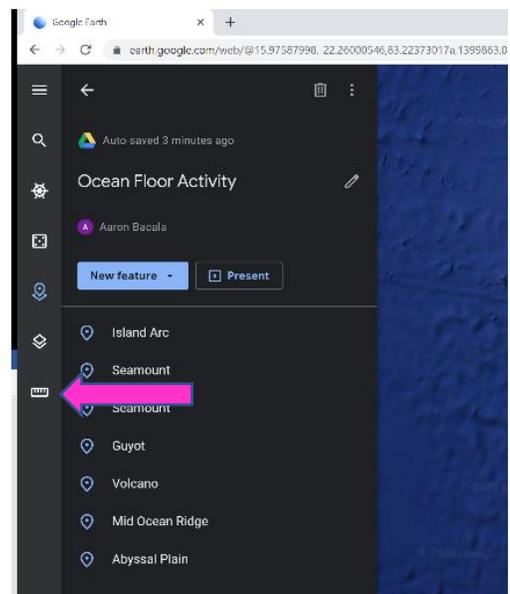
- Zoom out and explore the Pacific Ocean for another example of an island arc in Google Earth.
- Write the location of your example down in the space provide in the data table under Island Arc.
- Do the same for each feature listed in the project window.

Optional:

- Share data with other students by [clicking this link](#) and completing the Google Form.
 - If the link does not work copy and paste the following into Google Chrome <https://forms.gle/KEifByFtZ94q2vCeA>
- The data you share will be added to the Google Sheet ([click here](#)) so others can see the amazing ocean features you find. This sheet will be updated occasionally as more information is provided.
 - If the link does not work copy and paste the following into Google Chrome https://docs.google.com/spreadsheets/d/1QzZQN4hF2M8up0WRcF265zBu81_Pzk-bbbeNZrjNVQY/edit?usp=sharing
- If you are interested you can use the coordinates for examples provided by others.
- TOGETHER we can more fully explore the World's Ocean!

More Fun:

- Use the ruler tool (pink arrow) to measure the distance between features.
- Use the ruler tool to measure the distance from one feature to your home town.
- Use the ruler tool to measure the area of the Bermuda Triangle.



Ocean Features Drawing Pages

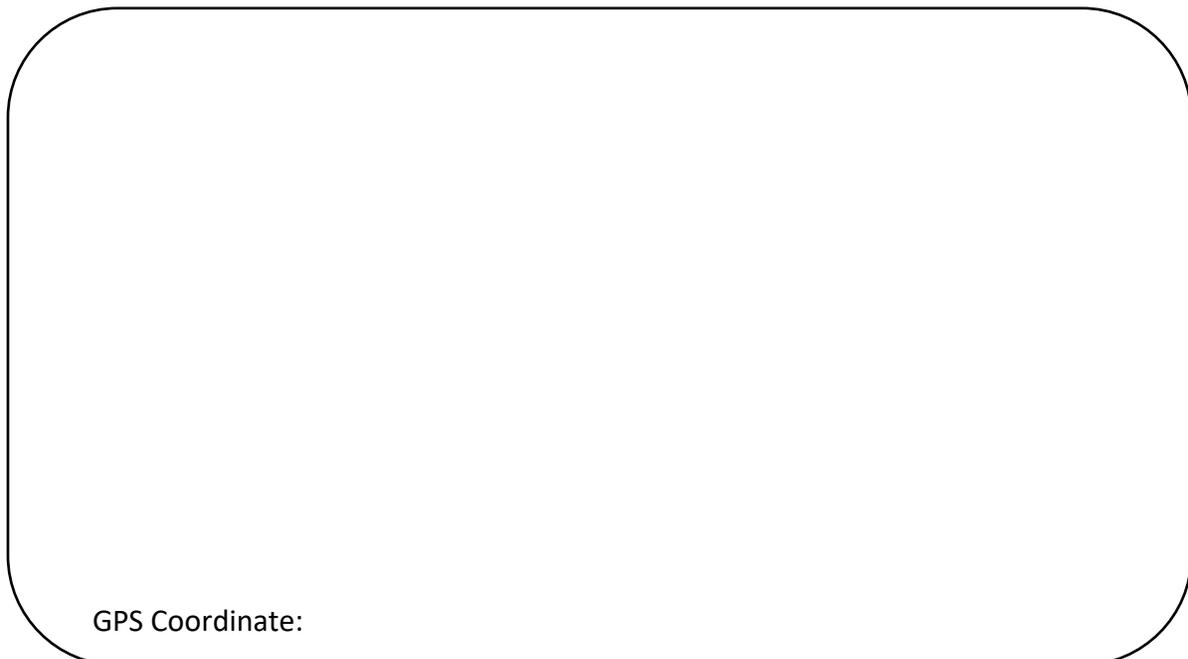
Draw the examples seen in Google Earth of each feature. Then see if you can locate more examples of each feature. Happy exploring!

Island Arc: A chain of islands formed by active volcanoes over areas in which the Earth's plates (or tectonic plates) are moving towards each other and is the result of one plate sliding below another. Volcanoes on island arcs can be active or inactive depending on their geologic age.



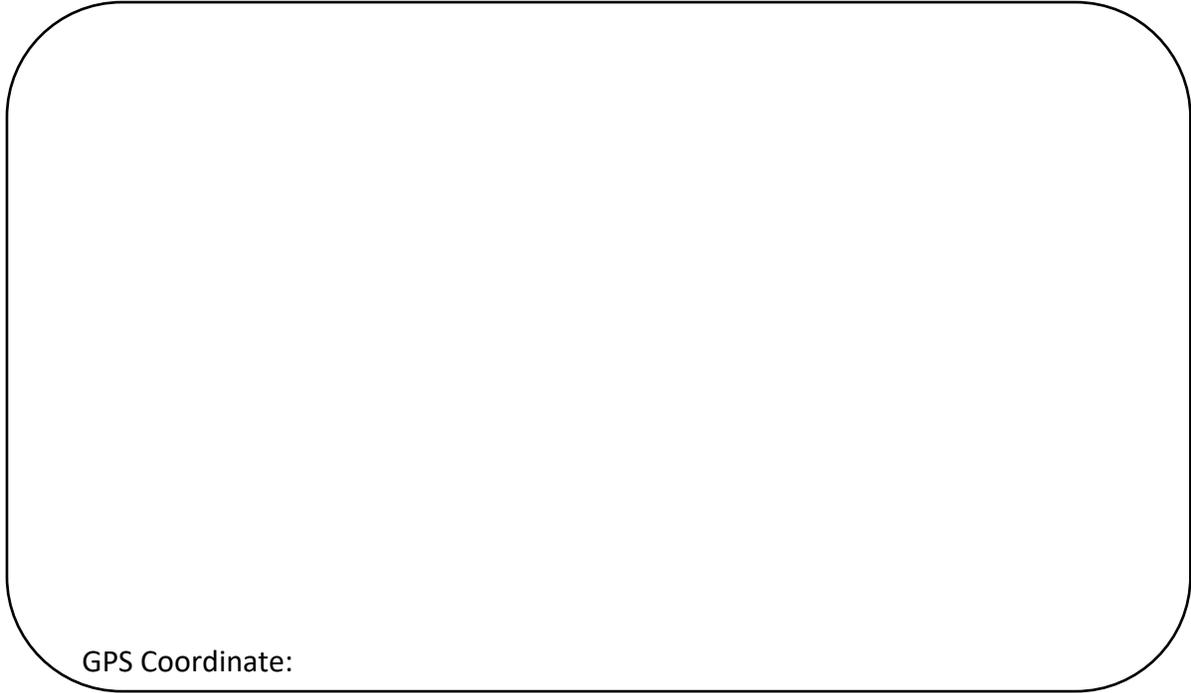
GPS Coordinate:

Seamount: A mountain rising from the ocean floor that does not reach to the water's surface (sea level). Seamounts are cone shaped and have features that rise to at least 3,281 ft above the seafloor.



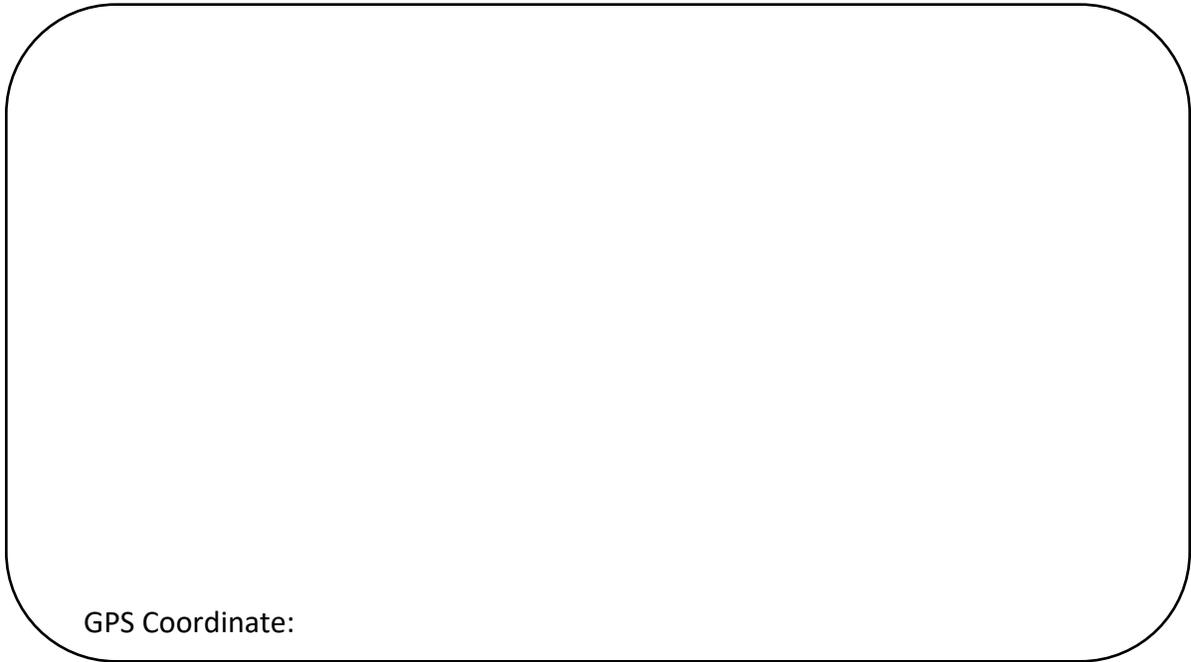
GPS Coordinate:

Guyot: Also known as a table mount, a guyot is an isolated underwater volcanic mountain (seamount) with a flat top more than 660 ft below the surface of the sea. Guyots show evidence of having been above the surface at one time but were ultimately weathered down by erosion caused by waves, wind, and rain.



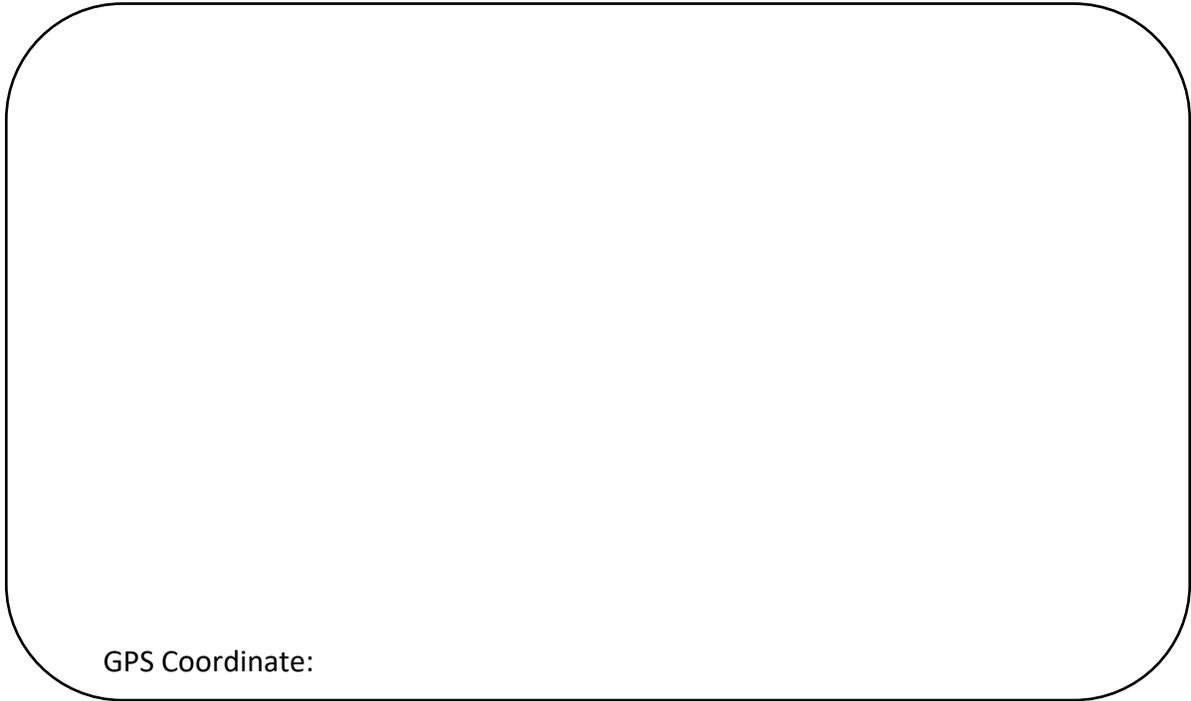
GPS Coordinate:

Volcano: An opening in Earth's crust that allows molten rock from beneath the crust to reach the surface. When molten rock contacts seawater, it cools and hardens. Over time, this process allows the hardened rock to stack higher and higher in the water column until it creates new land above the sea level, forming islands.



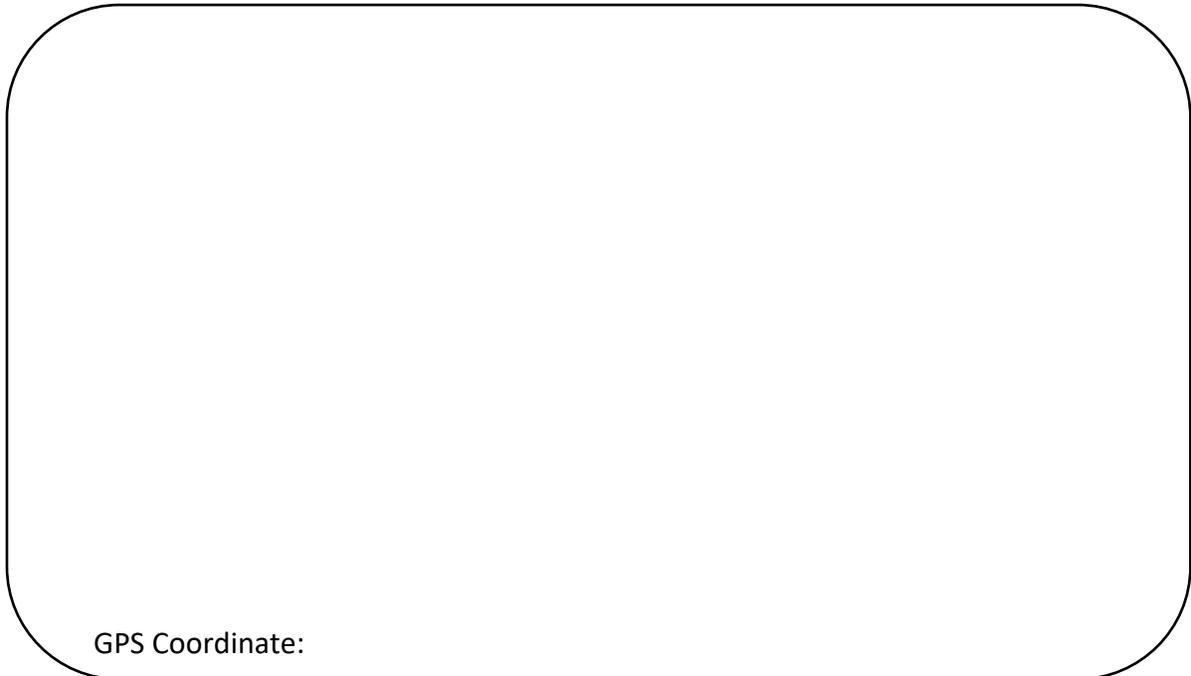
GPS Coordinate:

Volcano with a large volcanic crater: Just like a volcano but with a crater. The crater is formed by a major eruption leading to the collapse of the mouth of the volcano.



GPS Coordinate:

Mid-Ocean Ridge: An underwater mountain range formed by Earth's plates. They are connected across the globe to form a single ridge system spanning the length of 37,282 miles.



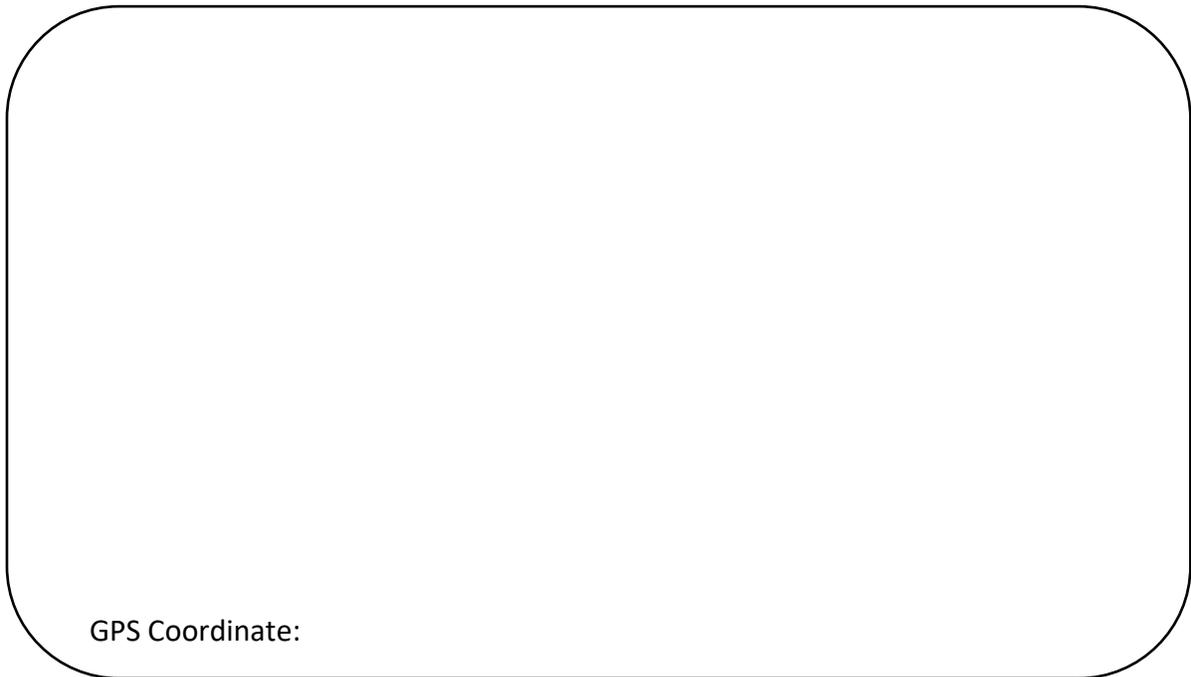
GPS Coordinate:

Abyssal plain: Any of the great, flat, sediment-covered areas of the ocean floor. They are located between the continental rise and ocean ridges. These plains cover more than 50% of the Earth's surface.



GPS Coordinate:

Abyssal Hill: Small, isolated, submarine hills that rise from the floor of an abyssal plain. They are more rounded on top than a seamount and are no more than a few hundred feet tall. They are the most common geological structure on Earth.



GPS Coordinate:

Features of the Ocean Floor Data Table

Discover more features and share the information with other ocean explorers.

Island Arc		Mid-Ocean Ridge		Abyssal Hill		Abyssal Plain	
Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude

Guyot		Seamount		Volcano		Volcano w/ Crater	
Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude

Distance Table

Location #1	Location #2	Distance	Area