FACTivity

American Samoa and Hawai'i are both a part of the United States. In this FACTIVITY, you will create a map showing the location of American Samoa in relation to Hawai'i. You will create the map using latitude and longitude. After you complete the map, you will answer several questions related to the map you created and additional map investigations you will conduct.

Common Core Connection

Time Needed

1 class period

Note:
To make this FACTivity reusable, your teacher will make copies of the three pages. The FACTivity may be done in the journal, but it will be one-use only.

Materials

- One copy of the Pacific Ocean grid map on page 90
- One copy of page 91 and page 93
- Scissors
- Glue

Have you ever wondered just what GPS is on a cell phone? Wonder no more! You are about to learn all about it!

Introduction

Latitude and longitude are imaginary lines on Earth (**figure 12**). Latitude provides a way to locate points on Earth north and south of the Equator. Lines of latitude are called parallels. Longitude provides a way to locate points on Earth east and west of the prime meridian (mə **ri** dē ən). The prime meridian is an imaginary line that runs from the North Pole to the South Pole. This line between the poles runs through eastern United Kingdom, western France, the center of Algeria in Africa, and along eastern Ghana in Africa. Lines of longitude are called meridians. You will find parallels and meridians on any globe and on many maps.

Every location on Earth can be identified using a combination of latitude and longitude. Latitude starts with 0 degrees (0°) at the Equator. The North Pole is 90 degrees north, and the South Pole is 90 degrees south. Longitude lines run east and west and start with 0 degrees at the prime meridian. On the exact opposite side of Earth,

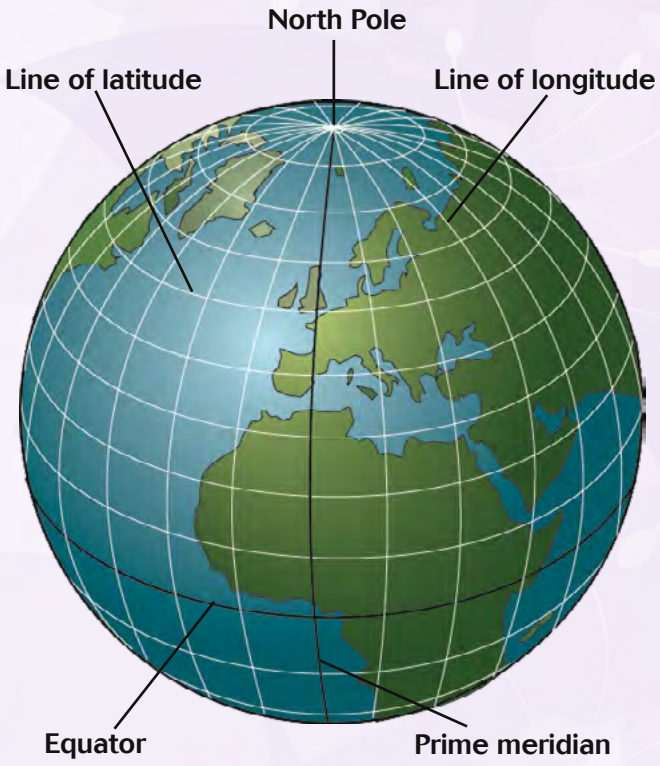


Figure 12. Lines of latitude (parallels) and longitude (meridians) on Earth. FIND Outdoors illustration by Samantha Bond.

longitude is 180 degrees. This line is called the antimeridian. Latitude and longitude lines are usually shown every 15 degrees. The distance between each degree is about 70 miles. For degrees of longitude, the distance between lines varies depending on distance from either Pole, but it is about 70 miles at the Equator (see **figure 12**, page 85).

In between the degrees of latitude and longitude, 60 more imaginary lines are drawn. These are called minutes and are symbolized with a prime symbol (′). In between each minute are 60 more imaginary lines. These lines are called seconds and are symbolized with a double prime symbol (″). The distance between minutes is about 1.2 miles, and the distance between seconds is about 100 feet. You will rarely find minutes and seconds marked on a map.

Every degree, minute, and second will also be tagged with its direction from the Equator or the prime meridian. Parallels (latitude) are either north (N) or south (S), and meridians (longitude) are either east (E) or west (W).

Minutes and seconds, along with the degree of latitude and longitude, identify the Global Positioning System (GPS) coordinates of any location on Earth (**figure 13**). You can use a GPS to identify precise spots on Earth's surface up to 100′.

GPS coordinates are used in cell phones to identify the location of the phone on Earth's surface. Signals are sent from at least four satellites orbiting Earth and received by your cell

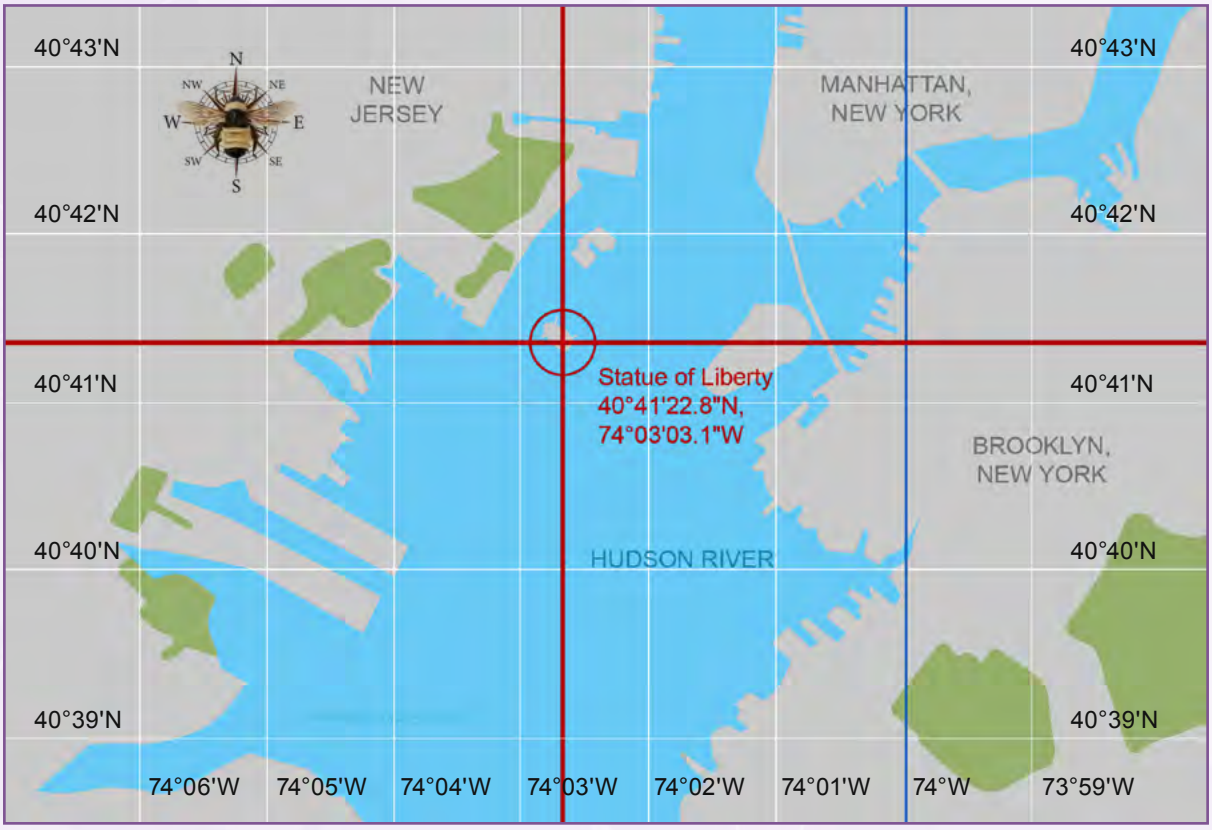


Figure 13. The Statue of Liberty in New York City is located at 40°41′22.8″ N, 74°03′03.1″ W. This notation is read "Forty degrees, forty-one minutes, twenty-two-point-eight seconds north, seventy-four degrees, three minutes, three-point-one seconds west." FIND Outdoors map by Liz Sisk.

phone. Your phone's GPS coordinate is calculated based on its distance from the satellites.

In this FACTivity, you will only work with degrees and minutes.

North is the direction from anywhere on Earth toward the North Pole (**figure 14**).

In this FACTivity, you will work with latitude and longitude to identify the GPS locations of the islands of American Samoa and Hawai'i. Hawai'i is the only State in the United States that is not in North America.

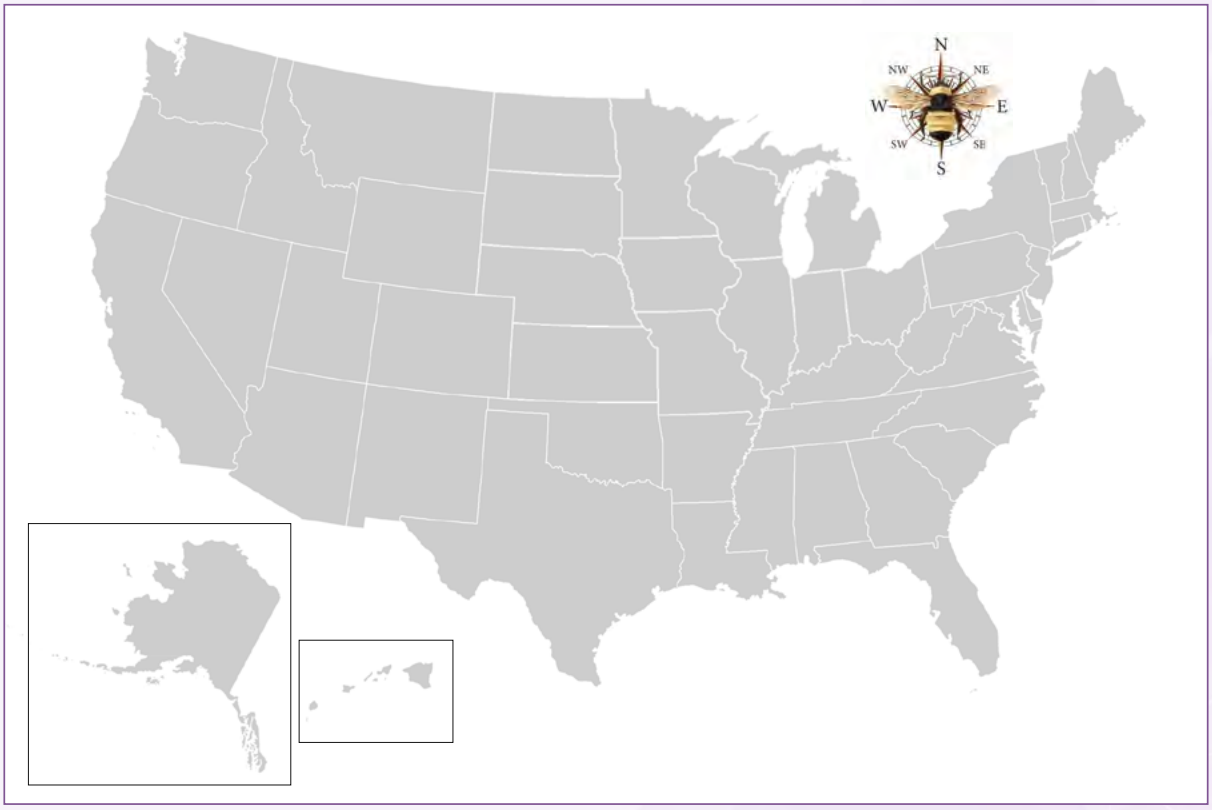
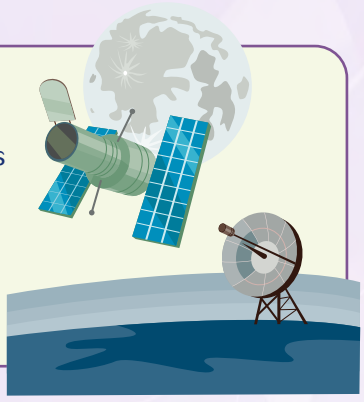


Figure 14. North is usually marked on a map using an arrow. Most maps are drawn with north pointing toward the top of the map. On this map, the bee compass shows the four directions, with north pointing up. FIND Outdoors map by Carey Burda.

What Is GPS?

The Global Positioning System (GPS) is a system of at least 30 navigation satellites orbiting Earth. A GPS receiver in your phone listens for these signals. Once the receiver calculates its distance from four or more GPS satellites, the receiver in your phone can figure out your GPS location. For more information, see "Web Resources" on page 94.



Methods

Begin by doing the exercises and answering the questions on page 89. These exercises will help you to envision the middle and western Pacific Ocean, where the research in this article and journal was conducted.

After you have completed the questions on page 89, your teacher will give you a copy of the grid map on page 90, a copy of the general island group shapes and the compass circle on page 91, a pair of scissors, and glue. The two island groups (American Samoa and Hawai'i) are shown within a general shape that includes all the islands in each island group.

First, write your name in the white space in the lower right-hand corner of the grid map on page 90. Cut out the *Natural Inquirer* compass on page 91. (Note that every map in every *Natural Inquirer* includes a compass.) Glue the *Natural Inquirer* compass on the west side of the grid map on or near the equator. North should be pointing toward the top of the map. Then, cut out the two island groups.

Around the north and east edges of the grid map, degrees of latitude and longitude are marked. Examine these marks and make sure that you understand what they represent. There are 4 white spaces where the latitude and longitude numbers for the 2 island groups should go. Fill in the white spaces with the correct degree of latitude or longitude. Refer to this FACTivity's introduction if you need help.

Mark the correct location of each island group by gluing the island group on the grid map using the information that follows.

The island groups include American Samoa and the Hawai'i islands. Each of the two island group shapes is marked with an arrow pointing north. The tip of the arrow points to the GPS location (coordinate) given following this paragraph. For example, Hawi, Hawai'i Island has a GPS coordinate of 20°14′ N, 155°49′ W. Find this GPS location on the map and glue the Hawai'i Island shape at that location. The arrow must be facing north, and it should be pointing at the given GPS location. You may line up the grid lines on the grid map and on your cut-outs to find the exact location.

GPS Coordinates for Hawai'i and American Samoa:

Hawi, Hawai'i Island: 20°14′ N, 155°49′ W

Pago Pago, Tutuila Island, American Samoa: 14°16′ S, 170°42′ W

To check your work, compare your map with the map on page 149.

Now cut out the shape of the 50 United States. ***Do not*** glue this shape on your map. Just place the United States shape on your map along the Equator, with the compass pointing north. Now, turn the shape so that the two United States coastlines are as close as possible to the Hawai'i and American Samoa island groups. What do you notice about the distance between the two coastlines? The distance between North Carolina's coast and San Francisco is just over 3,000 miles. About how far apart are Hawai'i and American Samoa? In what general direction is the United States arrow now pointing?

(Note that this FACTivity includes 49 of the 50 United States. Which State is missing?)

Now fill in the graphic organizer on page 93.

How Large Is the Pacific Ocean?

The Pacific Ocean spreads across 163 degrees of longitude (at the Equator), from 80 degrees west to 117 degrees east. Recall that the antimeridian, at 180 degrees, separates the directions from the prime meridian. In total, Earth consists of 360 degrees of longitude. Roughly what percentage of Earth's surface, from east to west at the Equator, is covered by the Pacific Ocean?

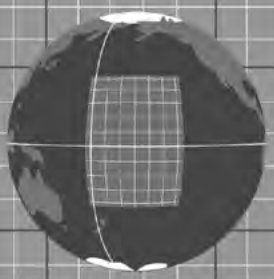
The Atlantic Ocean spreads across over 61 degrees of longitude (at the Equator), from 51 degrees west to 9.5 degrees east. Recall that in total, Earth consists of 360 degrees of longitude. Roughly what percentage of Earth's surface, from east to west at the Equator, is covered by the Atlantic Ocean?

(Hint: Add the number of degrees of each ocean at the Equator and divide the total by 360.)

Examine the map below (ignore the small text on the map). In pairs, discuss the relative size of the Pacific and Atlantic Oceans. How are their sizes and shapes different?

iStock licensed image.

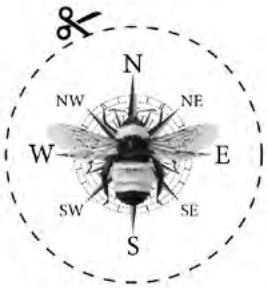
FACTivity PACIFIC OCEAN GRID MAP



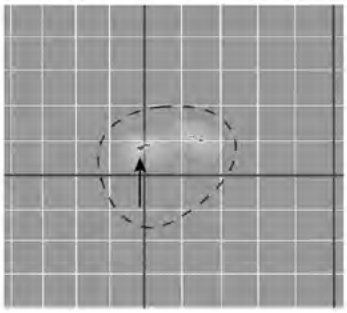
The grid above shows the location of this gridded map in the Pacific Ocean.

Name:

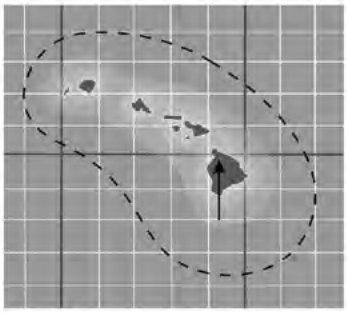
FACTivity Exercises • COMPASS & MAPS



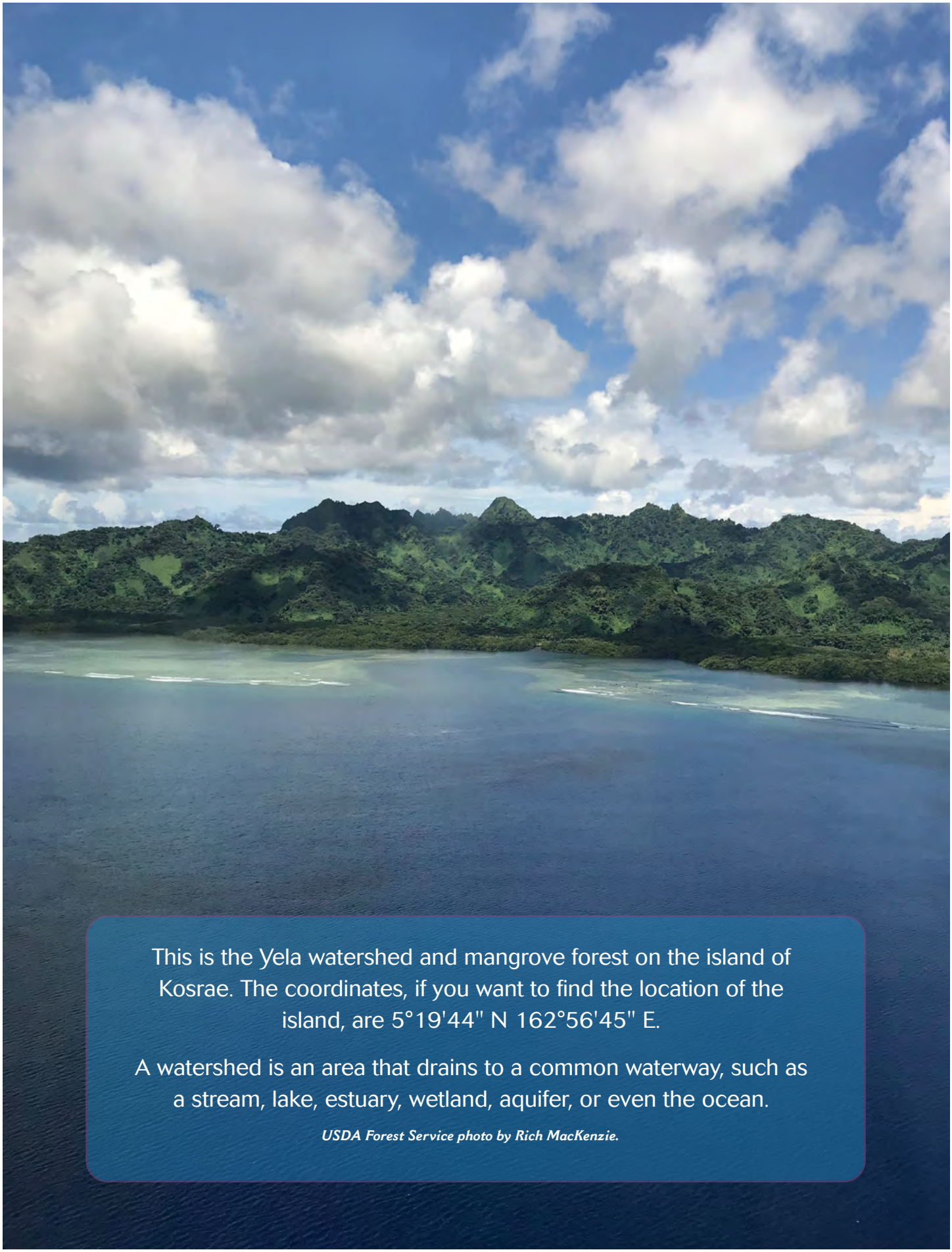
Compass



American Samoa



Hawai'i



This is the Yela watershed and mangrove forest on the island of Kosrae. The coordinates, if you want to find the location of the island, are 5°19'44" N 162°56'45" E.

A watershed is an area that drains to a common waterway, such as a stream, lake, estuary, wetland, aquifer, or even the ocean.

USDA Forest Service photo by Rich MacKenzie.

Graphic Organizer for "The Plot Thickens" FACTivity

Answer the questions that follow. Use the graphic organizer to record your answers. You will need access to a globe or to the internet to answer some of the questions.

Name: _____

QUESTION	ANSWER
In what general directions are Hawai'i and American Samoa located in relation to each other? Use the *Natural Inquirer* compass to help you.	
In which direction is the Equator in relation to American Samoa? In which direction is the Equator in relation to Hawai'i?	American Samoa: Hawai'i:
About how far from the Equator, in degrees of latitude, are each of these two island groups?	American Samoa: Hawai'i:
What information does a GPS on a cell phone provide?	
What is your home's GPS location (latitude and longitude)? You will need a globe or the internet to answer this question. Identify to the nearest degree. If you are on Google Earth, you can identify your home's location to the nearest minute and second.	
About how far from the Equator, in degrees of latitude, do you live?	
Do you live north or south of the Equator?	
Do you live east or west of the prime meridian?	
About how far from the Statue of Liberty, in degrees of longitude, do you live (see **figure 13**, page 86)? Do you live east or west of the Statue of Liberty?	
Using a world map, a globe, or the internet (such as Google Earth), find a city in Africa, a city in Asia, a city in Europe, and a city in South America. Identify and write each city's GPS location to the nearest degree.	Africa
	Asia
	Europe
	South America