Name: Date:

HANDS-ON ACTIVITY

Using GPS in Ecological Surveys

BACKGROUND

Recording observations of the types and numbers of organisms in an area allows scientists to monitor its ecological health. To do this, scientists must map the area. Making a map allows them to define exact positions where important objects or organisms were found, such as a rare plant or an endangered bird's nest. It also helps them notice differences between surveys. Because maps are so important, they need to be very accurate.

In the past, mapping an area was time consuming and difficult. Now, with Global Positioning System (GPS) technology, the process is easier and faster. GPS works because satellites orbiting Earth send information about their position to a receiver on the ground. The receiver calculates the distance of several satellites and the time their signals take to reach the receiver. It uses this information to establish its own location. The original purpose of GPS was to help military personnel navigate. However, the technology has become available and affordable to the general public. In fact, many cars today come with GPS technology to provide drivers with directions and help prevent them from getting lost. Professionals who make observations in the field—whether they are geologists, marine biologists, or forest rangers—have found their task much improved by GPS technology.

MATERIALS

- computer
- GIS computer program
- GPS receiver
- hammer
- local topographic map
- plant identification guides
- shoebox
- string, 15 m
- tape measure
- T-square
- wood stakes, 4

In this activity, you will survey a plot of land to see what types of plant life exist there. Your job is to divide the area into smaller parcels and collect samples for identification. You will then map the area using GPS, and record your data using the information provided to you by GPS.

SCENARIO

A local conservation group in interested in purchasing a tract of land to protect it from being developed. They have asked you, a plant ecologist and GPS specialist, to survey and map a portion of the area they plan to purchase. The information you gather will be used to make brochures and signage to educate visitors about plants that can be found in the area.

PREDICT

How can technology improve ecological sampling?

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PROCEDURE

1. Look at the map provided by your teacher. Find your town. Record a estimate of your longitude and latitude.

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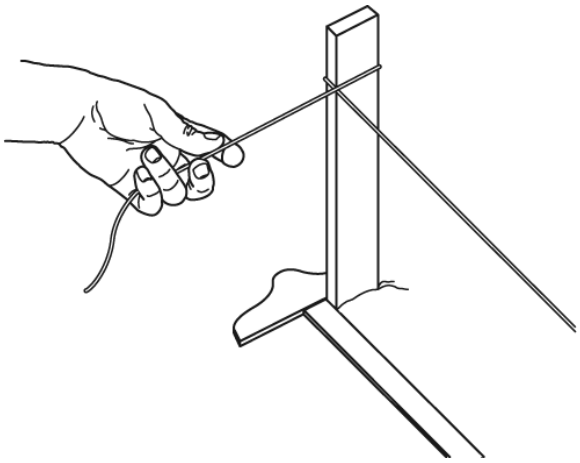
2. Your teacher will divide you into groups and assign an outdoor area for your group to sample.

3. Bring your stakes, string, shoebox, and GPS device with you. You should also bring these instructions and a pencil to record data.

4. Go to the area your teacher assigned to your group. Use the tape measure to measure out a length of 3 m on one side of your area. Hammer a wooden stake into both corners. Then, use a T-square to ensure a 90-degree angle. Measure a width of 3 m, and hammer your stakes into those corners, too.



5. Loop your string around each of the stakes. You should have an enclosed square that is 3 m long and 3 m wide. When your square is closed, tie the string in a knot so that it won't come undone. Keep the string close to the ground to avoid tripping.

6. Wearing gloves, begin collecting plant samples, including grass, leaves, and twigs that have fallen from nearby trees. You are attempting to determine what type of plant life is in the area. Any sign of plant life, whether living or dead, should be collected and recorded.

7. Place your findings in the shoebox. If you see any unfamiliar plant, ask your teacher before picking it up to make sure it is not poisonous.

8. Use the GPS device to find your longitude and latitude. Turn on the device. Stand in the center of your 9-meter square. As the device is connecting with the satellites, you will see the status page. Once the connection is complete, you will see the position page.

9. Clear the memory between uses. Select main menu, then go to User Wpt List. Highlight Delete all Wpts? and press Enter.

10. Wait until the status page shows that the signal is strong enough to be accurate within 200 feet or less. Then, press the WPT button to record your location. The GPS receiver will now output a reference number. Record the reference number:

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11. Once back in the classroom, you can begin identifying your plants using the reference manuals provided by your teacher. Wash your hands once you have finished. Record your data in Data Table 1.

12. Download your GPS data into the computer. The screen will show the date, the time your data was recorded, your reference number, and your longitude and latitude. Record that data in Data Table 2.

13. Wait until each group has had a chance to download their data. Your teacher will obtain the average longitude and latitude from the class recordings. Record those in Data Table 3.

14. Look at the computer screen data chart. Under the Other Functions option, print the class data table. Then turn off the GPS unit and view the map of your data. Attach the map and a copy of the class data table to your lab report.

15. Each point recorded will be shown on the map. You should see as many points as you have groups. Map the area your class surveyed in terms of samples.

16. Ask other groups what types of plants they collected. Make symbols for the more popular types. Then, using your map printout, mark the area where each plant was found with that symbol. Make sure to include a legend.

DATA TABLE 1: SPECIMENS RECOVERED DURING SURVEY

PLANT TYPE	NUMBER FOUND

DATA TABLE 2: LONGITUDE AND LATITUDE BY GPS

Date	
Time	
Name	
Longitude	
Latitude	

DATA TABLE 3: CLASS AVERAGE LONGITUDE AND LATITUDE

Average Longitude	
Average Latitude	

Name: **Date:**

ANALYZE

1. Based on the class plant data, what type of ecosystem did you survey?

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2. The members of Green Thumb, a conservation organization, want to keep track of the plant life within the area you surveyed. Design a procedure that would allow them to do so.

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3. How has GPS technology improved conservation efforts?

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4. Suppose you had surveyed a tundra ecosystem. How would your data have been different?

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5. Suppose there was a fire in the area that you surveyed. How do you think your data would be different if you repeated your survey five years after the fire?

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EXTEND

Use a computer-graphing program to make a frequency distribution showing the collective data for the class. For example, a histogram would allow you to display how frequently each species of plant was found. You could then compare the results and see which type of plant was most common in your survey area.