

Why use the GPS (Global Positioning System)?

The Global Positioning System helps us to find out exactly where we are on the surface of the globe. It gives our position in latitude, longitude and altitude (height above sea level). GPS data is crucial to the GLOBE Programme. When you enter data, others might ask, "Where did they record that information?". You need to know your precise location when you collect data so that GLOBE will be able to present your information on maps.

The GPS unit uses information from a series of satellites orbiting 20,200km above Earth). There are 24 satellites each sending out very accurate time signals accurate to one second in 150,000 years!) that the receiver uses to work out your position. The receiver picks up time signals from at least four satellites to determine your latitude, longitude and elevation.

GLOBE activities

You will need to use your GPS unit to **define all your study sites**. Your GPS locations will be required for the following measurement sites:

Study Area	GPS measurement
School	Take the measurements at your main entrance, send them to GLOBE to register for the database. You will need to do this to get your ID Code and Password.
Weather	Take the measurement at your weather station
Water	Take the measurement at your pond / stream / river
Soil	Take the measurement at your soil sample site
Land Cover	Take the measurement at the centre of each 90m x 90 m square
Phenology	Take the measurement at each tree you will study

You will need to take the GPS measurements at each site but as the location of a site does not change you only need to take them when you first start using that site. If you do change to a new site you will need to find the location of the new site and **define the new study site**.

GLOBE equipment and special instructions

Your GLOBE trainer will be able to lend you a GPS unit so that you can determine the unique location of your study sites. However, as GPS units constitute a valuable learning resource, your school may want to purchase one.

The GPS unit you use should have the capability and be set to:

- Express latitude and longitude in decimal degrees (ddd.dddd), to the nearest 0.0001 degree.
- Display time on screen in GMT
- Display altitude in meters

To use your GPS unit, simply switch on, wait until the receiver detects at least 4 satellites and record the latitude, longitude and elevation when they appear.

The numbers for latitude and longitude and elevation will change slightly while you are looking at them as the GPS tries to find more accurate readings. Remember it is communicating with satellites that are thousands of kilometres away. To compensate for the errors we ask you to take five readings over five minutes and then average them.

For full instructions on the use of your GPS unit see the detailed instructions in the pupils' guide.

Many schools throughout the UK are opting to share GPS unit.

Averaging your readings

If you have taken readings in decimal degrees in the form ddd.dddd you will have no problems working out the average for your five readings.

If your readings were not taken in decimal form, you or the pupils have to convert the degrees and minutes to decimal degrees.

To convert degrees and decimal minutes to decimal degrees:

To convert 39° 59.98 minutes to decimal degrees: $59.98 \div 60 = 0.99967$
So your location in decimal degrees = 39.99967

To convert 39.99967 back to degrees and minutes: $0.99967 \times 60 = 59.98$
So your location in degrees and minutes = 39° 59.98 minutes.

What If You Have Problems?

Time to lock sufficient satellites

After it has been switched on the GPS unit may require anything from about three to twenty minutes to find a sufficient number of satellite signals to find your location. If the receiver does not activate after depressing the ON/OFF button, then it may need new batteries.

The receiver is not displaying latitude or longitude

The receiver has many functions on various display screens other than the screen that displays latitude and longitude. The correct screen should automatically appear. If the required page is not appearing, try pressing the 'page' button until the required page appears. Read the manual to find your way around the function menu.

Status or poor signal quality icons appear

Do not record data if the poor signal quality message or icons appear. When the receiver has a good view of the sky, waiting or moving slightly will usually improve the signal.

Holding the GPS unit too close to your body blocks the receiver's view to the satellites and causes intermittent signal losses and poor signal messages.

Stand back or hold the receiver high. In thick foliage or heavy canopy, the receiver may be unable to lock to the requisite four satellites. Because the satellites move in the sky, trying again at a later time may provide better results.

If problems persist due to obstructions, move north or south and work out your location.

Remember 1 degree = 110,000 meters

So 0.0001 degree = 11 meters

If you start with a latitude of 52.4793 N and move 11 meters due North
your new latitude will read 52.4794 N

If you start with a longitude of 1.4598 W and move 11 meters due East
your new longitude will read 1.4597 W

GLOBE curriculum links

Geography Helps with understanding of a number of geographical principles, including latitude and longitude. A useful tool for geographical enquiry.

Key Stage 2	1 (a-e)	2 (a-g)	3 (a-g)	6 (a-e)
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Key Stage 3	1 (a-f)	2 (a-g)	3 (a-e)	6 (d-k)
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Science Helps with understanding of a number of scientific principles, including ways to transmit data and the earth in space. A useful tool for scientific investigation.

Key Stage 2	SC1.1(a,b)	SC1.2(a-d)	SC1.2(e-h)	SC1.2(i-m)	SC4.3(a,b)	SC 4.4 b	SC 4.4 c
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Key Stage 3	SC 1.1(b, c)	SC 4.4 e
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ICT Uses communications technology to perform a practical application.

Key Stage 2	1a	1b	3a	4 (a-c)
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Key Stage 3	1a	1c	2a	2b	3a	3b
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Mathematics The use of co-ordinates to determine position. Data handling and calculations. Using a calculator or spreadsheet. An introduction to Trigonometry.

Key Stage 2	2.1a-k	2.2a	2.2f	2.2i	2.3k	2.4e
	3.1	3.2a	3.4a,b	3.4e	4.1a,c-h	4.2 a, b

Key Stage 3	2.1 e	4.1 a	4.3 a-c
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English Following instructions from non-fiction source. Communication through discussion.

Key Stage 2	2.5f	2.5g	3.1e	3.2 (a-f)
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