

## Taking GPS Coordinates

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Taking accurate GPS coordinates that are also precise enough to return to individual trees is one of the most important pieces of data for this study.

Here are a few notes to ensure your GPS coordinates are accurate and usable:

- All GPS coordinates must be in the decimal degrees format (*hddd.ddddd*)
- The study region (Los Angeles and Riverside Counties out to Coachella Valley) will always give you a latitude value of 33 to 34 and a longitude value of -116 and -118
- You should allow your smartphone/GPS device to reach at least 5m (~16ft) of accuracy before recording the coordinate.
- The GPS coordinate must have at least 4 or more digits of precision after the decimal point to be usable.
- If using a dedicated GPS device, take two measurements to ensure the device has had enough time to calibrate.

What do these digits mean? We require 4+ digits after the decimal point because each digit can drastically change where that coordinate will point to:

Digit	Scale	Approximate Size
Before decimal point (and sign)	1000's of km and hemisphere	Global
Units digit	111 km	State
First decimal	11.1 km	Large cities
Second decimal	1.1 km	City blocks
Third decimal	110 m	Large field
Fourth decimal	11 m	Parcels
Fifth decimal	1.1 m	Individual trees

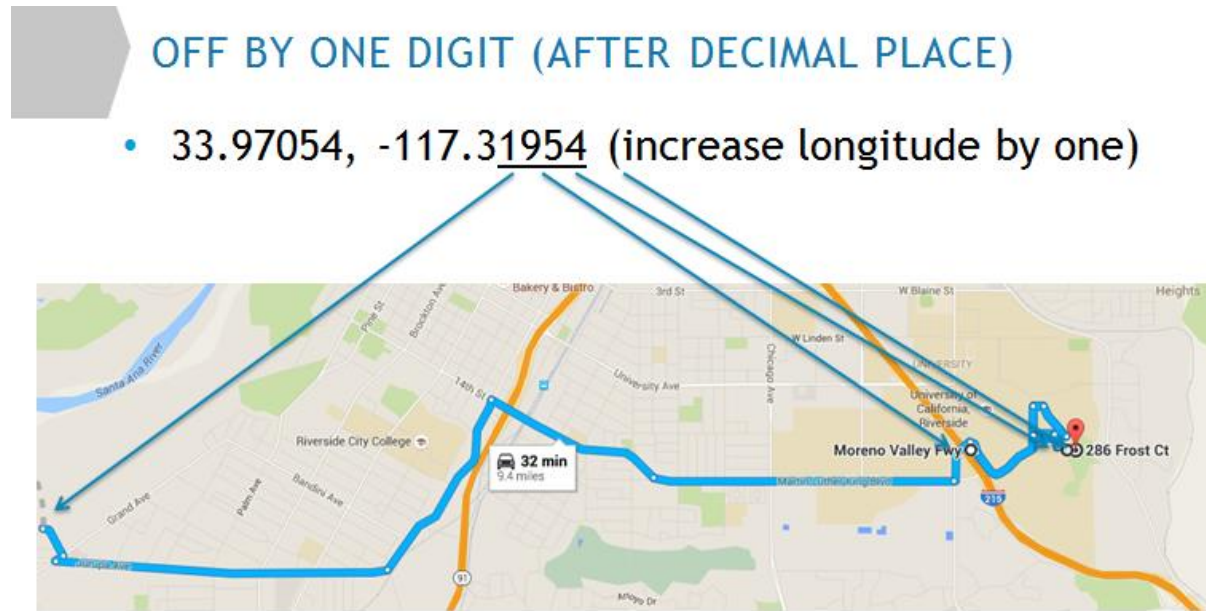
Here's an example:

If you measure GPS for a tree in the UC Riverside Botanic Gardens (GPS coordinate of 33.97054, -117.31954) even small errors in reporting or accuracy can have huge impacts.

- Longitude Changes:
  - Going from -117 to 117 (missing the negative sign) will put that data point in China
  - Going from -117 to -116 will put that data point in Joshua Tree
- Latitude Changes:
  - Going from 33 to 34 will put that data point in Barstow

Even errors in the numbers after the decimal place can obscure a location enough to make your tree impossible to find:

If you take that same GPS coordinate and for example, increase the latitude values by one at different points after the decimal place, you can still end up with wildly different locations:



\*Note effect of changes in decimal places (3 to 4, 19 to 20, 5 to 6, etc.)

How do I double check my numbers? If you know the approximate area you're going in order to measure trees, simply find that location on Google maps, right click, and select "What's here?". This will give you a GPS coordinate in decimal degrees at that point. That way, when you're in the field you can ensure your own coordinates don't vary beyond the 4<sup>th</sup> and 5<sup>th</sup> digit after the decimal point.

**Take your time in order to measure accurate GPS coordinates!**