GPS AND GEOCACHING

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The Origins of Geocaching

Geocaching, first coined by Matt Stum on the "GPS Stash Hunt" mailing list on May 30, 2000, was the joining of two familiar words. The prefix *geo*, for Earth, was used to describe the global nature of the activity, but also for its use in familiar topics in gps such as geography.

Caching, from the word *cache*, has two different meanings, which makes it very appropriate for the activity. A french word invented in 1797, the original definition referred to a hiding place someone would use to temporarily store items. The word *cache* stirs up visions of pioneers, gold miners, and even pirates. Today the word is still even used in the news to describe hidden weapons locations.

The second use of *cache* has more recently been used in technology. *Memory cache* is computer storage that is used to quickly retrieve frequently used information. Your web browser, for example, stores images on disk so you don't have to retrieve the same image every time you visit similar pages.

The combination of Earth, hiding, and technology made *geocaching* an excellent term for the activity. However the "GPS Stash Hunt" was the original and most widely used term until Mike Teague passed the torch to Jeremy Irish in September 2000.

https://www.geocaching.com/about/history.aspx

The Origins of Letterboxing

The origin of letterboxing can be traced to Dartmoor, Devon, England in 1854. William Crossing in his *Guide to Dartmoor* states that a well-known Dartmoor guide (James Perrott) placed a bottle for visiting cards at Cranmere Pool on the northern moor in 1854. From this hikers on the moors began to leave a letter or postcard inside a box along the trail (sometimes addressed to themselves, sometimes a friend or relative) – hence the name "letterboxing". The next person to discover the site would collect the postcards and post them. In 1938 a plaque and letterbox in Crossing's memory were placed at Duck's Pool on southern Dartmoor.

The first Dartmoor letterboxes were so remote and well hidden that only the most determined walkers would find them, allowing weeks to pass before the letter made its way home. Until the 1970s there were no more than a dozen such sites around the moor, usually in the most inaccessible locations. Increasingly, however, letterboxes have been located in relatively accessible sites and today there are thousands of letterboxes, many within easy walking distance of the road. As a result, the tradition of leaving a letter or postcard in the box has been forgotten.

https://en.wikipedia.org/wiki/Letterboxing_(hobby)

Geocaching can be added to hikes, to add a new focus and interest to the activity.

It can also be used in conjunction with traditional map-and-compass activities to expand and "modernize" orienteering courses. A discussion should follow on the pros and cons of using a GPS unit vs map and compass.

Geocaching can also be incorporated into STEM activities, focusing on how the technology works, and using the geocaching activity as "hands on" practice.

A good place to start is https://www.geocaching.com/. This site has a simple three-step guide to starting your first geocaching adventure, as well as an extensive database of geocaches around the world.

Vehicle (car/truck, boat, airplane) GPS units are the most familiar to most people, and are available as built-in options on many higher-end models. Though portable units are removable, they are generally not well suited to geocaching activities.

Handheld GPS units are preferred by most "serious" geocachers, as they tend to be more rugged than smart phones or vehicle units, have longer battery life – and usually replaceable batteries or battery packs – and have basemaps and software more suited for geocaching.

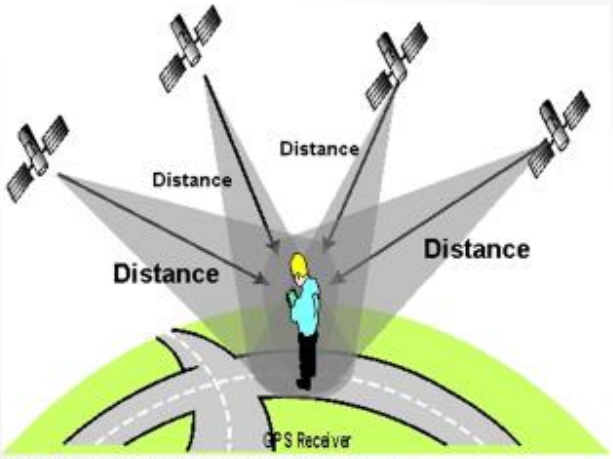
Most newer smart phones have built in GPS capabilities (that's what Uber or Lyft use to find you, and what ads use to point you to the nearest store, etc.). In order to use it for geocaching, you need to download an app with maps, geocache locations, etc. https://www.geocaching.com is a good place to start.

Fitness trackers and similar GPS-enhanced devices typically use GPS signals to calculate distances run, speeds, etc., but don't coordinate that with map data. With some devices, you can download the tracking data into a computer or laptop afterward, but that doesn't help at the time you're conducting the geocaching.

There are also GPS-based tracking devices, like car and truck trackers, etc. These use an additional layer of technology to log and/or send the tracking data to another device or location, and are not useful for geocaching activities.

How Does a GPS Receiver Work?

- Receives time signals from multiple satellites (at least 4).
- Measures the time delays from each satellite to the nanosecond.
- Uses **triangulation*** to calculate your (nearly) exact location.
- The signals travel nearly 1 billion feet each second, so even a 1 ns error in timing means an error of ~ 1 ft.



** See! Your high school math teacher told you that you'd use trigonometry some day!*

Note that civilian GPS units are only accurate to about 30 feet, unless more satellites are detected. It is important to tell scouts that the GPS unit will not put them "right on top of" the cache – they have to look around and explore the local area to find the cache.

How Does a GPS Receiver Work?

- The receiver needs signals from at least 3 different satellites to approximate your position – a 4th satellite signal will increase the accuracy and allow the device to determine altitude as well.
- A system of 24 to 30 continuously circle the globe providing universal coverage from anywhere in the world.
- Receivers do not work well where they can't "see" the sky. Clouds, however, do not affect them.

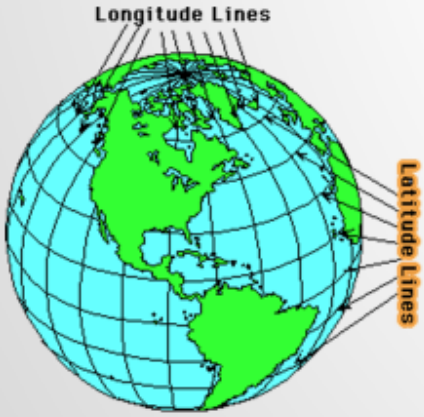
There are several GPS systems in use: the original one deployed by the U.S. military is Navstar (the default when using the term GPS). Other notable satellite navigation systems in use or various states of development include:

- Beidou – system deployed and operated by the People's Republic of China, initiating global services in 2019.
- Galileo – a global system being developed by the European Union and other partner countries, which began operation in 2016, and is expected to be fully deployed by 2020.
- GLONASS – Russia's global navigation system. Fully operational worldwide.
- IRNSS – A regional navigation system developed by the Indian Space Research Organization.
- QZSS – A regional navigation system receivable in the Asia-Oceania regions, with a focus on Japan.

https://en.wikipedia.org/wiki/Global_Positioning_System

40° 4' 51.74" N, 75° 26'32.45" W
What Does That Mean?

GPS Units use different systems to tell you where you are. The most common are:



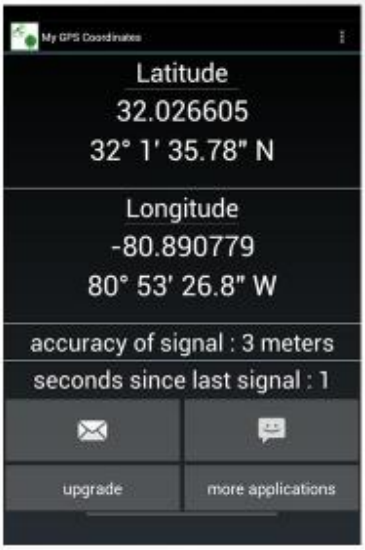
- **Street address** – this is what your car GPS (and Google maps) uses
- **Latitude and Longitude** – these are imaginary sets of vertical (longitude) and horizontal (latitude) lines around the globe. These are further divided:
  - **D° M' S"** – The globe is divided into 360 degrees, each degree is divided into 60 minutes, and each minute is divided into 60 seconds.
  - **D.DDDD** – Decimal degrees. Instead of dividing each of the 360 degrees into minutes and seconds, the fraction of a degree from the nearest latitude or longitude is given as a decimal.

40° 4' 51.74" N, 75° 26'32.45" W
What Does That Mean?

Since many geocaches are "in the wild", street address systems are generally not practical for geocaching.

Most handheld GPS units used for geocaching use some form of longitude-latitude system. Some are switchable from D/M/S to D.DDDD on their settings screen.

Some systems use other, more obscure systems (like UTM).



If your GPS unit doesn't do it, there are numerous apps that can convert D/M/S to D.DDD and vice-versa.

Note that with many GPS devices – especially lower cost devices – the GPS unit cannot tell its orientation until you start moving, so the directional indicator will be meaningless while you're standing still. Higher end models use an electro-magnetic "compass" to determine the orientation even when the device is not moving.

Rules & Etiquette

- **Safety first** – Advance scout the geocache. Avoid caches that
  - Have traffic concerns
  - Are near train tracks
  - Require dangerous climbing
  - Require swimming
- **Buddy system!** Always, always, always!
- **Respect:**
  - Avoid damaging sensitive ecosystems
  - Don't deface any object – natural or man-made
  - Respect private property
  - Follow Leave No Trace guidelines
  - Be careful of the area around the cache
  - Follow all laws and regulations
  - Respect other visitors to the area

Rules & Etiquette

If creating your own cache:

- Avoid sensitive ecosystems
- Avoid archeological/historic sites
- Avoid private property
- Be mindful of the area around the cache
- Put the cache in a secure, weather-proof container
- Never bury a cache – GPS units are not accurate enough to have the cache finders dig in the correct spot.

Rules & Etiquette

- Cache In – Trash Out (CITO)
- Write an entry in the logbook
- Take something, leave something (TSLS)
- Taking a "travel bug" (trackable) requires you to log that you have it, and to then send it on its way.

Tips for Geocaching with a Unit

- Cover the minimum "how to" basics at a meeting beforehand
  - Keep it brief and simple
- Go outdoors! The sooner they're geocaching, the more enthusiasm they'll have!
- Find parents / leaders who have an interest in geocaching
- Ideal as a patrol or den activity. Optimal group size is ~ 5–8
- A good follow-up to map & compass orienteering
- Make your own Scout-themed geocache course!

Resources

- www.geocaching.com
- www.geoscouting.com
- Www.geocreed.info
- Geocaching merit badge pamphlet https://filestore.scouting.org/filestore/Merit_Badge_ReqandRes/Geocaching.pdf

Thank you! Have fun! Geocache!