

Global Positioning System (GPS) devices are now common, adding mapping functions to cell phones, cars, boat navigation, etc. GPS is based on satellite technology, using their signals to identify the location of places in a global coordinate system (such as Latitude/longitude), and permitting tracking and mapmaking functions. GPS systems, especially high precision tools, are used in IRS searches to create maps, to locate discoveries on the land, to find places recorded in archival data or survivor testimony, or to locate the surveys of search systems such as ground-penetrating radar (GPR).

What is GPS?

GPS is a location technology that uses data from satellites to allow devices to be located in a global coordinate system. GPS is frequently used to make maps (with geographical information systems – GIS) or to provide guidance for routes or to specific locations. Most GPS devices have a margin of error which is too large ($\pm 1-2\text{m}$) for search projects. Search teams need to locate within $\pm 0.25\text{ m}$ or less – the size of a potential burial. High precision GPS is available in a range of forms, with specialized equipment and sometimes with cellular data/wifi and/or a high precision subscription. While standard GPS devices are useful for approximate locations, high precision GPR is needed to relocate areas of interest with precision or to accurately project evidence from search results onto the land.

What Role Can GPS Play in Identifying Missing Children?

High precision GPS is used to location the position of survey devises (so that results can be correctly located on the land) and to collect location data for visible surface features of interest (to produce maps). They are available in two main forms: RTK (real time kinetic) GNSS (global navigation satellite systems) and subscription data systems. GNSS runs from a dedicated set of satellites, and this service is gradually replacing older GPS systems, although GNSS is downgraded in some locations for security reasons. RTK GNSS systems typically use a base station and a rover. The base station sits on a tripod on a fixed (control) point and does two things: 1) over time it compiles a precise measurement the location of the control point and 2) it provides a reference location for the rover. The rover is a mobile unit that can be attached to other devices, such as a GPR cart, and records its location relative to the base station. Accurate and precise mapping is possible with these two devices, the rover can map the land and the base station can precisely locate the rover on the earth's surface. RTK GNSS systems are used for tracking positions of drones or survey carts and for mapping specific locations such as control points.

Subscription data systems use a single device, much like a GPS or a rover from an RTK GNSS system. Using data connectively from a paid subscription app through a cell or wifi network, these systems can locate positions with similar precision to RTK GNSS systems. Subscription data systems are less expensive than RTK GNSS systems and are used for mapping control points and other features of the landscape.

What Are the Challenges of GPS?

GPS is familiar to most people now as map tools on cell phones. The main challenge is the cost of equipment, and the training necessary to use high precision devises and software. Additionally, conversion of spatial data from GPS to spatial databases such as GIS requires training.