HOW TO USE YOUR GPS ON THE 2017 SPREE MAPS

If you know how to use a GPS device and you have a good map, you should never get lost again! Once you have read this article, you should be able to convert the reading from your GPS to a point on a map and thus know where you are. Doing the inverse, calculating the GPS reading of a specific point on a map, can also be useful in planning a hike. I am assuming that you understand UTM but if this abbreviation is nothing more to you than three meaningless letters, please read my other article ("Basic GPS information") to find out why UTM is so much easier to use than Lat/Long. Although UTM is a metric based system, don't let that scare you. Just remember: when you are out on a hiking trail, a meter and a yard are close enough to being the same distance.

Turn on your GPS and in the Setup or equivalent screen, set the Navigation or Units so that the position system is UTM (sometimes called UTM UPS) and the datum is NAD83. This is the datum used for the Spree maps. After changing to these settings, and when your GPS has found its location, the reading on your screen should look like this: **12S 0360369 3824748** (probably on two separate lines on the screen). The significance of these numbers and how to use them will soon become clear. Note that the "12S" grid is a very large square that covers almost all of Arizona, so I have dropped these three characters from the readings below. The first set of seven digits after the 12S is called the "easting" because its value increases as you go east. The second set of digits is the "northing" and its value increases as you go north.   The word "ENJOY" is a good mnemonic for this order, East then North, due to its first two letters (E N) – enjoy the outdoors!

To follow this description in this article, print a copy of the 2017 Spree map "6. Honeybucket" from the Highlands Center website. On this map, look for the UTM grid in purple and the small numbers on these gridlines. In particular, find the number 359 on the middle vertical line (the easting) and the number 3822 on the lower horizontal line (the northing). Locate the point where these two lines cross (close to the middle of the map). This is the southwest corner of the kilometer square bounded by these two lines, and its GPS reading would be **0359000 3822000.** Let's suppose you were hiking this Spree trail with your GPS turned on. Let's also suppose the GPS reading on your screen was **0359390 3822480**. This means your location is 390 meters east and 480 meters north of the SW corner of the kilometer square that is 359 east, 3822 north – the grid corner I just described above.

How do you know where on the map this point is? The scale chosen for the map we are working with makes that easy – the scale is 1:10,000, as shown in red in the Legend Box (bottom left of map). Find a ruler that shows centimeters and millimeters, and measure the distance between the GPS grid lines (north to south, or east to west). They should be very close to 10 centimeters (when you printed the map, some minor change in scale may have occurred). If you are reasonably good at math, you can multiply 10 cm by 10,000 (the scale) and get 1 km. Calculated out: 10 cm x 10,000 = 100 thousand cm or 1 thousand meters or 1 km. It doesn't matter if you understand this, just remember that 10 cm on this map represents 1000 meters on the ground, or more usefully 1 cm on the map represents 100 meters on the ground (which is essentially 100 yards).

So from the starting corner (where the 359 line crosses the 3822 line), measure 390 meters east (3.90 cm) and 480 meters north (4.8 cm) and this is where you are. Of course, I chose a recognizable point – the place where there is a trail junction (trail #322 & trail #326) marked with the plus symbol (+).

You may have noticed that the units digit on both my easting and northing readings above were both zero. Even though your GPS always gives a value for these units digits, it is essentially meaningless – your GPS is only accurate to about 10 meters at best, so round the units digit down to zero (if value is 1-4), or round up (if value is 5-9) by adding one to the tens digit.

Now, to test your understanding, use your metric ruler to calculate the reading of where trail #326 crosses trail #333 (near the middle of the map). For the easting, you will measure the distance from the 358 gridline (about 8.0 cm). For the northing, you will have to work backward from the 3822 northing line because the 3821 gridline is below the bottom of the map (put the 10 cm mark of your ruler on the 3822 line, then the junction is at 9.7 cm lower). So the reading for this junction is: **0358800 3823970**. Mark this and my first calculated reading above on your printed map. Then, when you hike this trail, you can see how close your actual readings are to these two calculated readings.

You now know how to calculate the GPS location of any point on any of the Spree maps, or inversely, use your actual GPS reading to see where on the map you are. The map I used in the above example has a scale of 1:10,000, which is stated in red near the bottom of the map legend. Some of the other Spree maps use different scales such as 1:5,000, 1:12,500 and 1:20,000. All these values were carefully chosen to make conversions of GPS readings to map locations easy. To save you the math, here are the relationships:
- 1:5,000   2 cm = 100 meters (20 cm between UTM gridlines)
- 1:10,000   1 cm = 100 meters (10 cm between UTM gridlines)
- 1:12,500   0.8 cm = 100 meters (8 cm between UTM gridlines)
- 1:20,000   0.5 cm = 100 meters (5 cm between UTM gridlines)

If you try to do these conversions on a standard USGS topo map (7.5 minute map), it's not so easy because the scale there is 1:24,000. However, you can buy a small transparent plastic square which is designed for these maps, and makes conversion quite simple.

The datum NAD83 stands for North American Datum 1983. Another commonly used UTM datum is NAD27 which was set up in 1927. Since then, with satellites and other techniques, the Earth has been more accurately mapped resulting in NAD83. Most modern maps use NAD83 whereas the USGS topos, which have been around for a long time, use NAD27. In Arizona, to convert from NAD83 to NAD27, add 65 meters to the easting and subtract 203 meters from the northing.

Good Luck! Nigel Reynolds

PS: If you have questions, drop me an e-mail at: nigelzz@commspeed.net