

Adventure Racing Navigation

Part 2: The UTM Grid

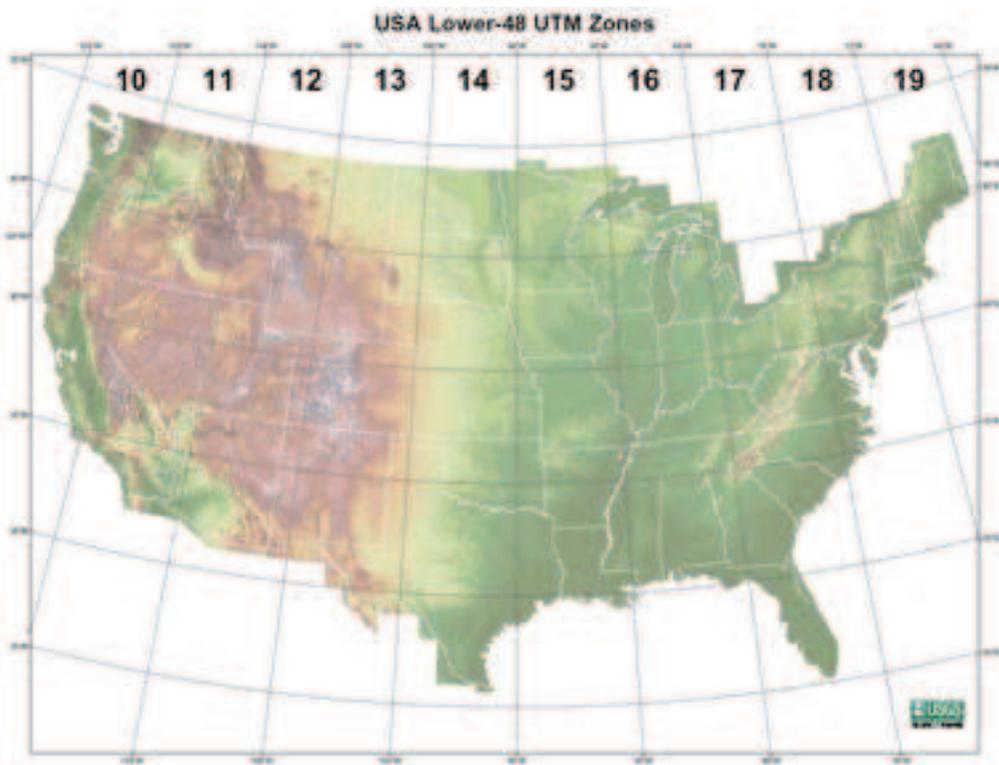
by Mark Manning

This is the second in the monthly series of navigation articles from AR Navigation Supplies. This month we are going to focus on an important subject in AR navigation, the UTM grid. Plotting a UTM coordinate can be one of the most daunting tasks given to a new adventure race navigator. Let's shed some light on the UTM system and how it developed.

The Universal Transverse Mercator System or UTM was developed by the military and is a way of describing a point or position anywhere in the World using a seven digit reference on a grid measured in meters.

If you look at any decent map in almost any country you will find a grid overlay that is used to describe a location using coordinates. Most regional grids are based on the current global reference model called the Geodetic Reference System of 1980 or GRS 80. Within individual countries the grid can be localized for regional best fit based on the countries topography and local differences in the shape of the Earth in that region.

The contiguous 48 states are spanned by 10 UTM zones described by a letter and number from Zone 10 in the West to Zone 19 in the East, and from R in the South to U in the North.



In recent history the US has used 2 grid systems to overlay the national series of USGS (United States Geologic Survey) maps. The earlier grid is called NAD 27 and is based on the North American Datum of 1927, which itself was based on the Clarke ellipsoid of 1866. With the huge advances in navigation since 1866, the NAD 27 UTM coordinates are generally not suitable for use with GPS systems due to the inaccuracies of the grid over a large area. The unfortunate thing about the NAD 27 grid is that it is currently the one that's printed by default on a USGS map.

The more accurate and up to date grid for North America is NAD 83, which was introduced in 1986 and

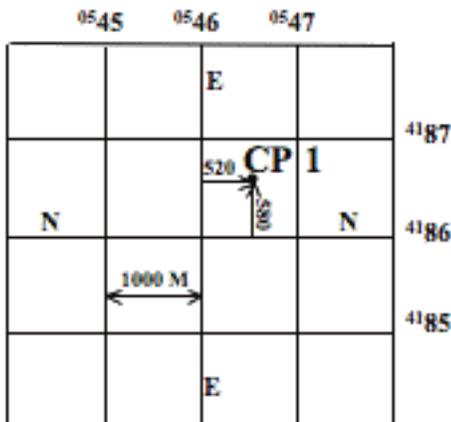
is based on GRS 80. The NAD 83 grid is compatible with current GPS systems and is shown by dashed crosses at the corners of a USGS map. You should be able to spot them on the bottom left corner of this month's Navigation Challenge map.

Having two grids can sometimes cause problems in adventure racing navigation when points have been plotted using a GPS configured for NAD 83 but the maps that are given out have a NAD 27 grid. The same coordinates for each grid can be hundreds of meters apart. This problem was quickly discovered while plotting points at a Northern California event a few years back when a bike checkpoint at a light-

house actually plotted on the map about 300 meters out in the San Francisco Bay. I have also been to events where both grids have appeared on the map and you have to ensure that you're plotting the UTM's on the correct grid. We were lucky on this occasion that each grid was printed in a different color. This was one time when it really paid to listen at the pre race briefing.

It is possible to find software that will convert between the two grids, and most GPS systems can be configured to either, but the important point to remember is that you need to know if the UTM's you've been given are correct for the grid printed on the map, especially if they came from a race director using a GPS rather than plotting from the race map.

UTM grids are based on 1000 meter squares that are part of a larger regional grid and zone. The grid numbers are calculated on the number of meters East and North of a reference point. Plotting a UTM point is a simple matter of counting the number of meters East and North from that reference point to the point you are interested in. Map makers are kind enough to print the number of meters for



each grid along the top, bottom and sides of the map. Once you have found the 1000 meter square associated with the coordinates you are given, it's then a matter of counting the number of meters East and North into that square to get the exact point you are looking for.

In the example above the line E-E is 546,000 meters East and line N-N is 4,186,000 meters North of the reference. As each square is 1000 meters wide we can divide the square into 10 smaller squares to give our location to 100 meters. We could then divide those smaller 100 meter squares by 10 to give our location to 10 meters.

If we divide up the square in the diagram above we find that CP 1 is 520 meters East of line 0546000 and 580 meters North of line 4186000, so its full UTM coordinate is 0545520 East 4186580 North. To give our position on a global map we should also include the Zone reference, for example 10S 0545520 4186580 would place us in Northern California very close to the Golden Gate Bridge.

UTM tools make dividing the 1000 meter square very simple by giving you an overlay scale that easily allows you to count the meters into the 1000 meter square. UTM Tools come in many shapes and sizes and are scaled to match the map you are using. Most UTM tools will only show increments of 20 meters but some of the more accurate ones like the Basic Roamer AR are marked in 10 meter increments for more precise plotting.

Because there are so many different map scales used in adventure racing it is important to use the

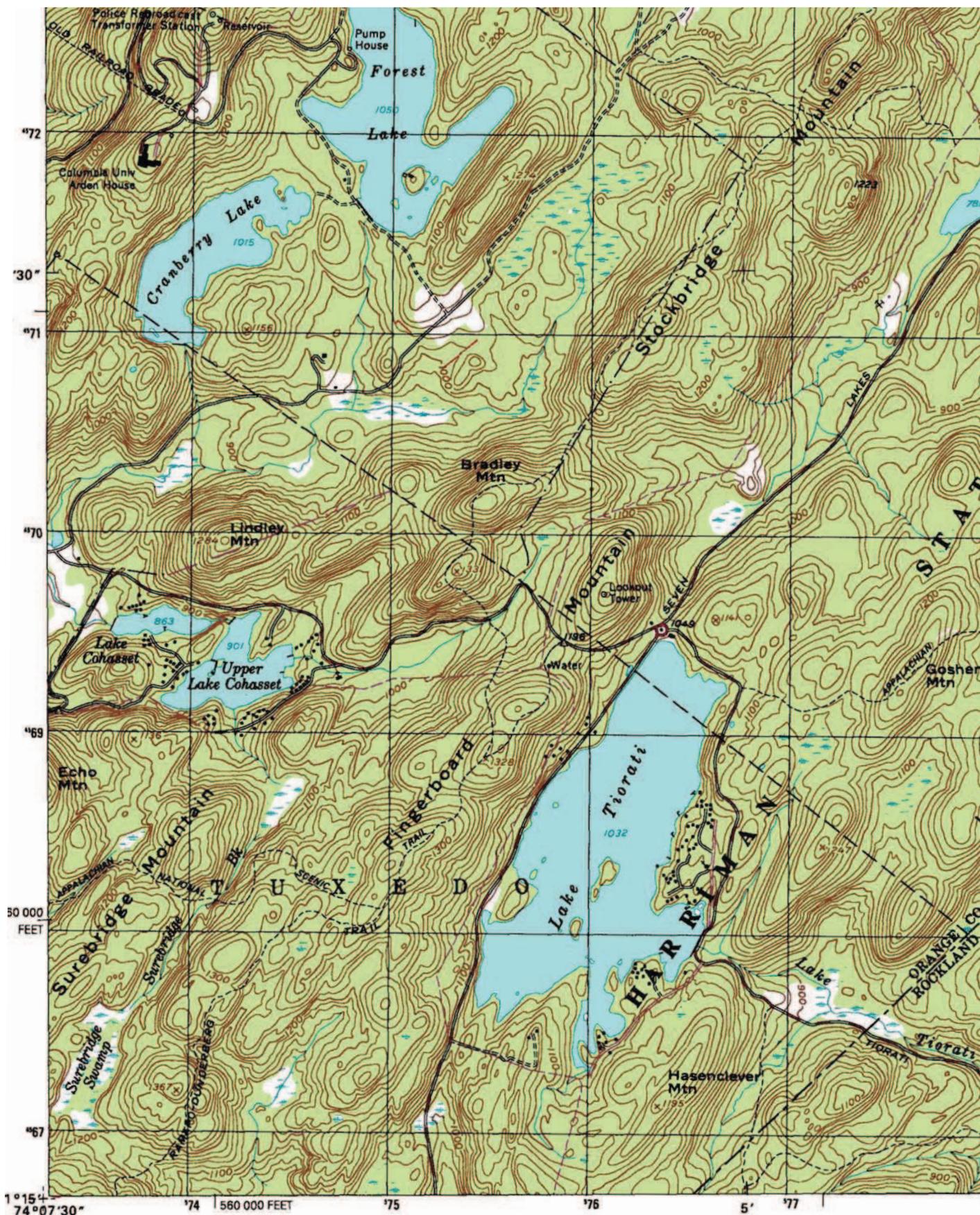
correct UTM grid for the map being used. USGS maps of North America generally use a 1:24,000 scale and require a 1:24,000 UTM tool. Using the wrong scale will guarantee a misplaced point on the map. This is easily done if you're using a UTM tool that has multiple scales as 1:25,000 and 1:24,000 grids look very similar. A handy tip is to place a mark with a pen or piece of tape next to the scale you are going to use so as its easy to find when you're tired and under pressure.

If necessary you can make your own UTM tool by placing the Northeast corner of a piece of paper along the kilometer scale on the map and marking the edge in 100 meter increments.

More information on UTM plotting can be found on the features page of the Basic Roamer AR at www.ARNavSupplies.com

AWM Navigation Challenge Round 2

Try your navigation skills from the comfort of our own home with this online navigation contest. Answer all the CP questions in order by following the instructions below. E-Mail your answers to info@adventureworldmagazine.com.



Adventure World Magazine Navigation Challenge: Round 2

True North and Grid North are assumed to be identical on this 1:24K map.

This month your team traveled to New York State for the second round of the Adventure World Magazine Navigation Challenge, brought to you by www.ARNavSupplies.com and the Basic Roamer AR.

Checkpoint	Instruction	Question
Start	Find the Pump House in UTM Square 0574 - 4572	What are the UTM coordinates of the Pump House?
CP 1	Kayak from the pump house on a bearing of 154 degrees for 0.45 mile to the island in the lake.	What is the elevation of the top of the island?
CP 2	From the island paddle a bearing of 248 degrees and leave the boats at the shore.	How many meters from the island to the shore of the lake and the trail junction?
CP 3	From CP 2 travel via the flattest route to the highest point in the southern most edge of the grid square at 1156 feet.	How many contour lines are crossed?
CP 4	From CP 3 travel due South to the road. Pick up your Mountain Bikes and turn East to follow the road for 1.82 miles to the trail intersection.	What is the elevation of the trail intersection?
CP 5	Plot UTM 0577020 - 4572130	What is at this location?
CP 6	Follow the trail that leads to Bradley Mountain.	What is the difference in elevation between CP5 and Bradley Mountain peak?
CP 7	a. From the Peak of Bradley Mountain plot a bearing of 203 degrees true North b. From the Peak of Lindley Mountain plot a bearing of 97 degrees true North	What is the elevation of the intersection of these two bearings?
CP 8	From CP 7 continue in a South East direction on the trail to the road and follow the road East to the benchmark at elevation 1196.	What is the UTM of the Water within 150 meters of the benchmark?
CP 9	From the benchmark at elevation 1196 continue on the road to the traffic circle at elevation 1049.	What is the name of the road that leaves the traffic circle in a NE direction?
CP 10	Pick up your kayak from your crew and paddle to UTM 0576550 4567940	What is the True North bearing from CP 9 to CP 10?
Finish	Email your answers to: info@adventureworldmagazine.com	