Adventure Racing Navigation

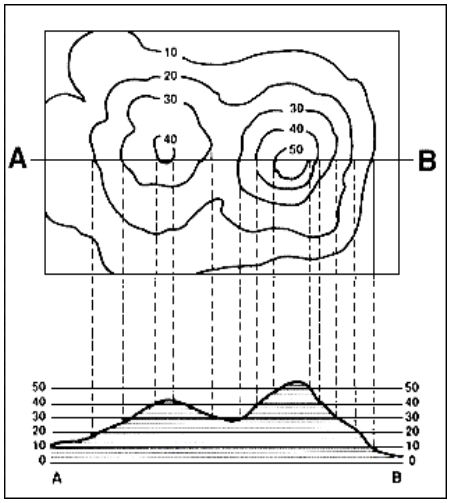
Part 3: Contour Lines

by Mark Manning

Welcome to the third in the monthly series of navigation articles from AR Navigation Supplies.

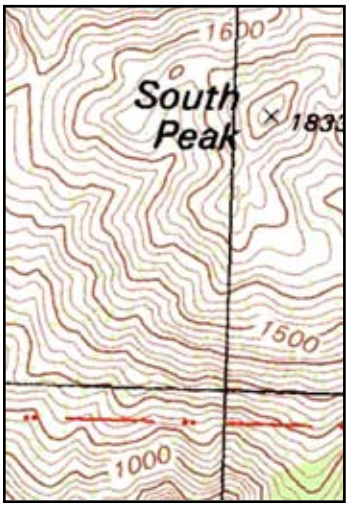
I once asked a teammate to hold the map during a race. He looked at me and asked with a dead straight face, what are all these squiggly lines for? There was a reason we never let him navigate. This month we are going to take a look at Contour Lines and how to read the contour information provided on a USGS topographical map. Lets start with some important points about contour lines that will help us understand the information they contain.

Contour lines connect points of equal elevation
Contour lines never cross
Contour lines provide a 3 dimensional view of the terrain they represent as shown in Fig 1.



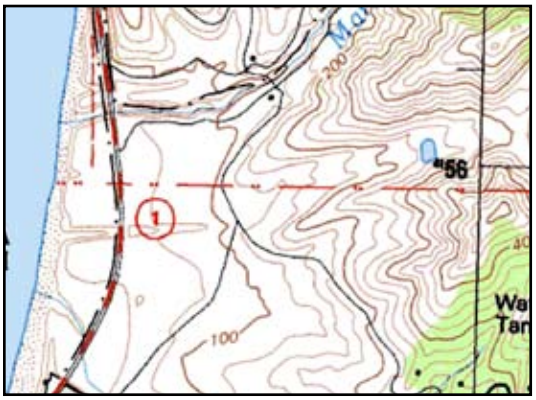
The light and dark brown lines shown on a USGS topographical map represent the elevation above Mean Sea Level at each line and give a pictorial view of the terrain they represent. Mean Sea Level is normally determined from a regional, fixed reference point due to the changing tides.

Contour lines have a fixed interval of elevation change in tens and sometimes hundreds of feet. To avoid obscuring too much map detail contour lines are only labeled with the actual elevation every few hundred feet. These marked contour lines are normally slightly thicker and darker than the others. These thicker lines are referred to as major contour lines. The elevation change between contour lines is called the contour interval. The contour interval is normally clearly marked on the map legend and can change on each map. Contour intervals can also be determined by dividing the difference in feet between two major contour lines by the number of lines that are counted to get from one major contour line to the next. E.g. If we have 100 feet between major contour lines and we count 4 lines from one major contour line to the next, we would divide 100 by 4 and determine that the contour interval is 25 feet for the map we are using.



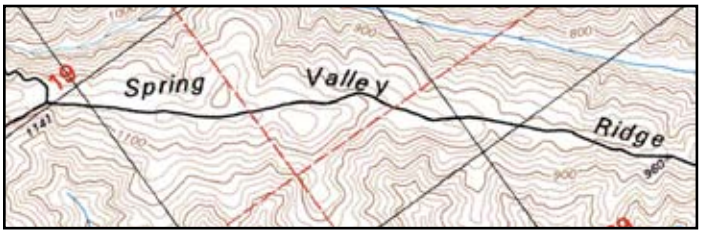
Lake levels will also be shown as elevation above sea level. The lake level will normally be marked on the lake and will be determined by the level of the spillway if there is a dam or by the stream exiting the lake if there is no dam present. Many lake levels will actually be lower than marked on the map as the water level changes during the season when the streams and lakes start to dry up. This can affect route choice and planning by as parts of a lake that are shown as underwater on the map could in reality be dry.
One of the most important features of contour lines is their ability to show how steep the terrain is. This is critical for route planning. The steeper the terrain the closer together the contour lines will appear. Widely spaced contour lines will represent much flatter and easier terrain.

Your team will be much happier if you can take them to the next CP via a flatter route rather than going straight up the side of a mountain or off the edge of a cliff,

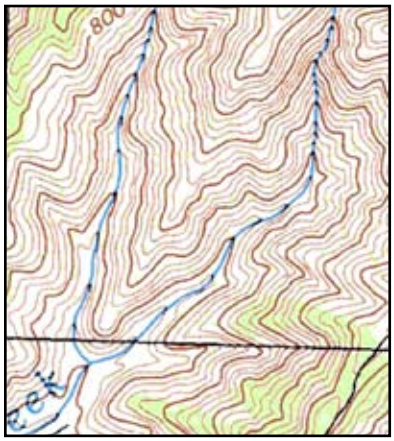


so pay close attention to the contour lines if you have multiple route choices. Counting the number of lines you cross on each route can give you a good indication of elevation change.

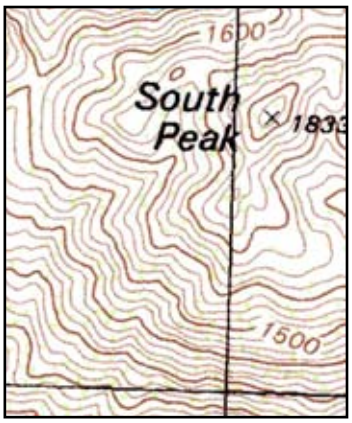
By carefully reading and interpreting contour lines it is possible to identify many important terrain features that will help with your route choice while navigating. These can be features such as Gullies, Ridgelines, Valleys, Peaks and Knolls. It is essential to be able to identify these features and understand how they will affect your travel. Below are some examples.



Ridgeline. Trails often run along ridgelines giving a relatively flat route between two points.



Gullies often contain streams



Mountain Peak. These often have the elevation marked.

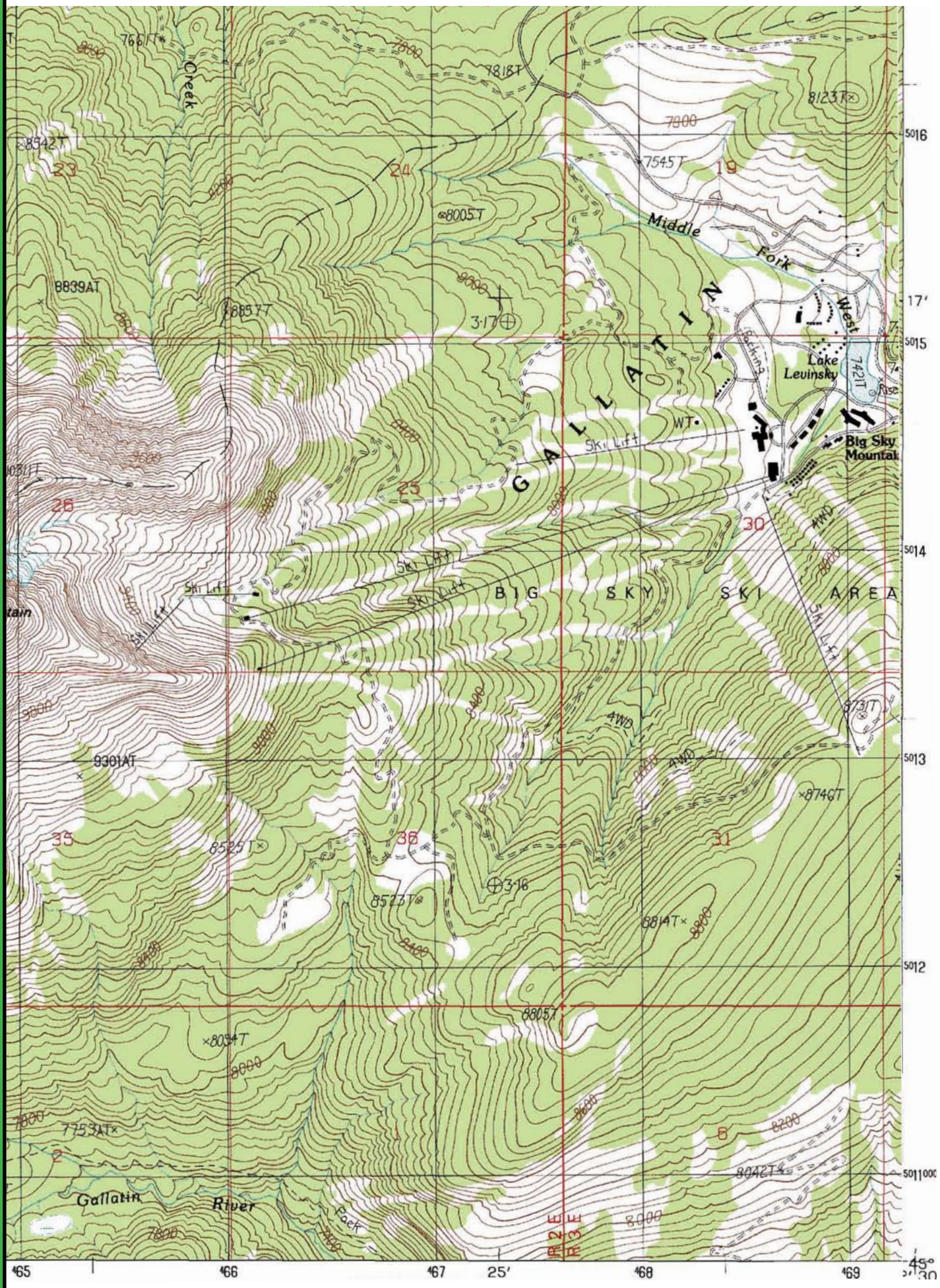
Using the contour lines in conjunction with an altimeter will allow you to determine how far up a hillside you are or your point along a trail based on where the trail crosses certain contours. The important thing to remember is to regularly reset the altimeter at known elevation points. The accuracy of an altimeter will change with time due to variations in air pressure and local weather patterns. Resetting the altimeter when you reach a point on the map where the elevation is known or clearly marked will greatly help your accuracy. Trail intersections and mountain peaks are very useful reference points so look out for them and note the elevation as you pass.

It is always useful to practice the interpretation of contour lines. Some useful techniques for this are to look at the terrain around you and imagine how that terrain would look if it were represented by contour lines. You can also look at a map and try to picture how the terrain would look if you were walking on it. This will help improve your ability to read the contour information provided on a topographical map during an event.

More information on navigation can be found at www.ARNavSupplies.com.

Mark Manning. AR Navigation Supplies, Inc. 2008

AWM Navigation Challenge Round 3



Adventure World Magazine Navigation Challenge: Round 3

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

This month your team traveled to Big Sky, Montana and Primal Quest 2008 for the third 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 building at UTM 0469220 5014600	What is the elevation of the building?
CP 1	Cross lake Levinsky to the Northwest Stream.	What is the length of the lake in Meters from its southern most point to the Northwest Stream?
CP 2	Follow the Middle Fork West to its fork at the L in Middle.	What is the elevation of the Fork?
CP 3	Follow the Southern Fork of Middle Fork West until it crosses the grid line 0467.	How many contour lines are crossed from CP2 to CP3?
CP 4	From CP 3 travel North and slightly East for 130 meters to the knoll at 8005 feet.	What is the UTM of this Knoll?
CP 5	From CP 4 Plot a bearing of 247 degrees for 0.7 of a mile.	What is the elevation of this knoll?
CP 6	Follow the 8800 contour line to its intersection with the fire road in UTM square 0466 5014	What is the straight line distance in miles between CP 5 and CP6?
CP 7	Follow the fire road South to an elevation of 8440 feet.	What is the UTM of this intersection?
CP 8	Plot UTM 0468200 5012220	What is the bearing from CP 7 to CP 8?
CP 9	Bushwhack down the mountain to the top of the Ski Lift in grid square 0469 0513 at 8660 feet.	How many contour lines are crossed on the straightest route?
CP 10	Follow the Ski Lift down the mountain to the base of the lift	What is the length of the Ski Lift in meters?
Finish	Email your answers to: info@adventureworldmagazine.com	