Dealing With Those Tricky Canyon Winds
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In the realm of long and extreme range shooting there is a “dark art” considered to be bordering on voodoo by some, talked about by few people and written about even less. Welcome to long range shooting over terrain features, you will not find much written, videoed or taught about the effect that terrain has in concert with wind on the flight of your bullet, so let us begin.

There is enough information written about shooting long range over flat ground and standard windy conditions to fill a small library. This is all good information and should start as your basis for wind compensation knowledge. The issue for most comes when terrain formations affect the wind on the flight of our bullet. The best way I know to tell about these effects is to give some examples of terrain / wind combinations that can cause misses if you don’t compensate for them.

Example 1: Let’s start simple and this one gets a lot of people because it is so simple. You are lining up a shot at a distant target say 600 yards, you are shooting level but along the side of a slope like in figure 1. You have a full value wind coming from 3:00 @ 15 mph. Let’s give you the benefit of the doubt and say you are shooting a 338 Edge with Berger bullets, muzzle velocity 2850 fps and a BC of .818. You have dialed up your drop of 8.50 moa and see that you need to adjust the windage 2.75 moa right or about 18 inches. Life is good you have practiced out to 1000+ yards and are dialed in like nobody’s business. The mule deer is a real stud and you have waited all year for this moment. The wind is stable; your position is rock solid despite lying on the 45 degree side hill you’re shooting along. You settle crosshair of the Nightforce scope on the mulie and press the trigger. To your horror the bullet strikes perfect for windage but just over the deer’s back by a couple of inches and he takes off for the next zip code. What could have possibly gone wrong? When you doped the wind the Kestrel gave a good reading of 15-15.5 mph steady and you confirmed direction by visual indicators around you to estimate the same speed and direction. The issue you missed was the wind you felt and saw blowing full value from your right was blowing into the 45 degree side hill
you’re laying on, this of course caused your bullet to drift left and you compensated for that by dialing 2.75 moa right. However it also caused the bullet to impact higher because as the wind followed the angle of the side hill it also pushed up on the bullet at a 45 degree angle causing it to strike high. How in the world do I read and compensate for this you ask? This is the easy part, as you look at this shot you know see that this effect is going to happen before you shoot. With this in mind a 45 degree wind is a ½ effect wind no matter how you look at it. When this effect is noticed you dial your correction into the wind to correct left and right windage, then you look at the half value effect of wind lift because of the terrain feature so you take ½ of 2.75 moa or roughly 1.50 moa off of your elevation to compensate for the lift. This will drop you back down to the center of the vitals. This was a pretty simple correction because the wind / terrain effect was over the entire distance of the shot.

Example 2: Things can get a little trickier when we have multiple conditions effecting different parts of the shot. Here is a common canyon shooting scenario. Your shooting down a canyon in the evening, conditions are pretty good 2.5-3.0 mph at your back going down the canyon, effectively a no value wind. The canyon meets with another canyon forming an intersection, (figure 2) the angle of this intersection is about 45 degrees or half value in terms of wind effect. The far canyon wall has a rock about 1 moa in size just begging for it. You back off the focus on your spotting scope and see the mirage laid over from the right to the left to the tune of 6 mph. So to determine what portion of the shot is affected by this cross wind you use your range finder to read the target at 1748 yards and the edge of the cross canyon closest to you is right at 1100 yards for a cross canyon width of 648 yards. Your program quickly tells you that a 650 yard ½ value 6 mph wind is a correction of 1.75 moa to the right. You also because of the extreme distance calculate the spindrift and Coriolis Effect and find you need 1.75 moa left correction for that. The two calculations cancel each other out within a couple of inches. You settle into your rifle and take the shot, after waiting for the bullet to travel it’s 2.5 second flight to the rock you are pleasantly rewarded with a solid first round hit despite the fact that the bullet’s flight path looks like a snake, first drifting right only to be pushed back to center by a wind affecting only part of the flight. On this shot we had to consider extreme range effects (coriolis and spin drift) along with the fact the wind was blowing two different directions over the flight of the bullet. In these instances you simply need to break
down the wind effect and the distance it is affecting the bullet into different "legs" of the flight. When you stack the corrections up you can get pretty accurate predictions for our shot correction.

Example 3: Forever most people have been taught that a head wind or tail wind is simply a "no value" wind. I have seen this one bit several people in the field. While it may be true that there is left/right compensation, take this example to task. You’re shooting down a canyon at 600 yards just to one side and have a 20 mph head wind, no value left or right. You look down the canyon and see that the drops away from you at a 45 degree angle or so for 300 yards before running out on an almost flat bottom (figure 3). In this situation most would simply shoot and be disappointed by missing high. Much like example 1, we have a 45 degree terrain feature affecting part of the shot. So we break this shot down, for 300 yards of the shot we have a ½ value wind lifting the bullet off of its flight path. I look at my windage figures for 300 yards to find a 20 mph wind is a correction of 2.00 moa since it is ½ value, I will go down 1.00 moa from my elevation correction. Not correcting this would have accounted for the bullet striking 6” high at only 600 yards. While striking 6” high might still be a good hit on a large game animal not correcting for these effects will hold you back from shooting longer distances at some point.

Example 4: There are some terrain features that no matter what are just going to be difficult at best to shoot over. Anywhere two wind masses collide can be horrible to shoot through, take for example, shooting across a drainage where two forks of a canyon come together (figure 4). Let’s say it is evening and the air is cooling and causing some down canyon winds. Wind is like water in many ways, when I am looking at a wind problem I try to imagine what water would do if running like the wind over the terrain. With that in mind when two volumes of water come together and the exit is still the same size it has only one
choice, it has to go up until the resistance drops enough to let it continue on its way. So again you can shoot up canyon from this spot or down canyon from this spot by simply reading the wind and correcting for it. If you are shooting directly over the convergence of the two you will experience your shot going high because of the path of least resistance effect as well as the normal windage you can see. These are extremely difficult to read and correct for because we cannot use terrain angle to work from or most of our conventional methods for estimating wind and effect. The first time I ran into this the key factor letting me know I had a lifting effect (besides hitting 2.00 moa high) was a White Fir tree. The fir had branches moving all over it but given that the wind was blowing 8 mph this was normal until I noticed that the branches were moving up and down and very little to the right (the direction of the wind). I watched this effect happen for quite a while, we shot a few more shots using the fir tree as an indicator of how much to adjust our elevation with pretty good success. It wasn’t until the next day that the effect really came to light in a gusty wind of 0 to 6 mph. At zero wind you shot normal calculate correction in both elevation and windage. During gusts of 6 mph you dialed into the wind for windage and down 1.50 moa in elevation. Shooting here got to be pretty easy after a while and made you feel like you were pretty smart, but long range shooting has a way of kicking you squarely in the groin just about the time you start to think you know what your doing.

There are some subtle little points of canyon shooting that can be a real eye opener. Take for example wind speed in a canyon, you read your Kestrel windmeter at the shooting location and see 5 mph full value, you use the spotting scope to see that the grass and other foliage across the canyon is moving the same direction and speed as the side you’re on. Now most people would assume that shooting this for 5 mph correction would be a safe bet and they generally would lose whatever they had bet. Again back to watching the water, if you look at a stream or river the water closest to the bank moves slower than the open water in the middle of the river. I have seen the wind act in the same manner in canyons most of the time (there are not many absolutes in long range work). If I was lining up the above shot I would shoot it for a 9 or 10 mph correction. In my area this is a good rule of thumb, to double the wind over the open air of canyons. Now this is influenced by more factors related to the topography of your area than I can count. In the end you will have to practice these reading and compensation techniques and adapt them or parts of them as your own methodology for long range compensation of wind effects.

These have been some of the examples of shots I have taken or spotted over the years that took me to task. I have been accused of all sorts of voodoo like methods for correction of wind effects but in the end when the wind bit me I simply figured it out. When a shot goes sideways instead of shrugging
your shoulders, sit down and take a good look at the terrain features around the shot. There is a good chance that the wind and terrain have conspired to put one over on you. The good news is that you can conquer all of these problems if you just study them a little while and really think about what is going on.

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