

## Reading the wind

Bryan Litz has an excellent chapter on reading wind in his book *Applied Ballistics for Long Range shooting*. In there he talks about wind at the rifle vs. wind at the target and which is better to read. All things being equal on a wide open range both are the same and will affect the bullet the same. What does affect the flight path is the wind at a point in the trajectory that the bullet experiences a different surroundings. The example he uses is at Lodi. That range is tree lined on both sides except for a cut at the 400yd line. So since there is a different surrounding there that area is a good place to watch at that range.



The other thing about ranges that are tree lined on both sides like Lodi (above), Oak Ridge (below),



and Miami Valley R+P in Batavia, Ohio (below)

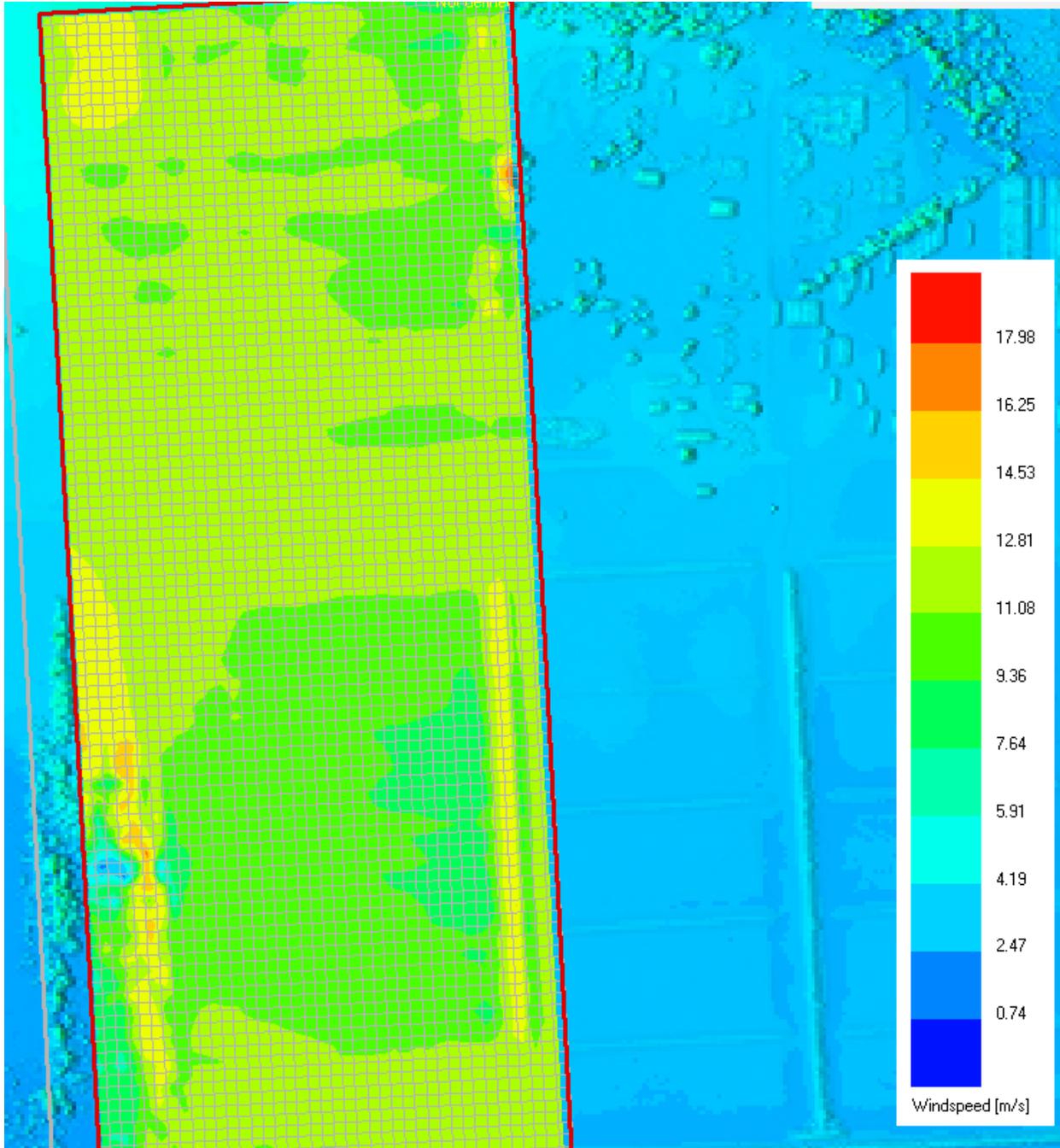


is that while they generally are protected from wind laterally. When wind blows up and down the range you will get swirling. This is very common at Lodi where the 23 wind flags can be pointed in many different directions. The swirling can come from either the geographic terrain (i.e. hills) or from the fact that the flags themselves are being interfered with from swirls by the trees.

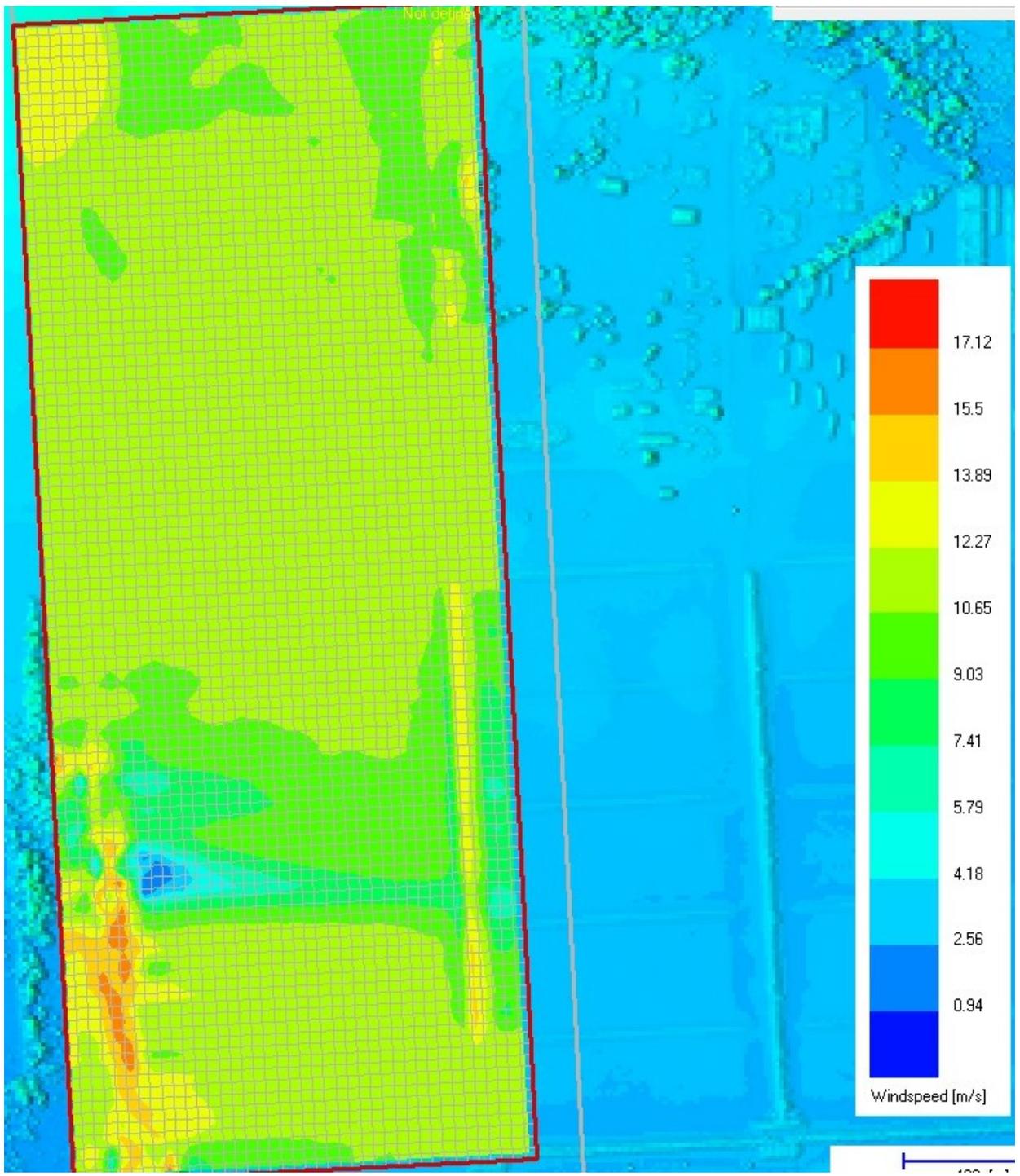
Camp Atterbury Range 6 (along with Ranges 3 and 5) is different. It is wide open however from about 500yds on in you do have the cemetery to the west and a hedge row to the east. Forming a tree lined alley



Because of this alley affect you will see that it does slow the speed of the wind down when out of the east.



The wind used for calculation was 10m/s but regardless of the speed you will see the same drop. Also notice there is a slight tunnel effect up against the berm. If we flip the wind around to the west we



A somewhat similar pattern but not as large in distance and we notice some lower velocity regions that push all the way across. The difference is due to the inconsistencies of the woods. Either way we see that in the alley there is a definite different region of wind velocity.

There are wind flags located on the left side at the 600yd berm, on the right side just behind the 500yd berm, and in between points 20 and 21 (generally middle of the line) at the 300yd berm. The outside flags are range flags so they are heavier and do not show the subtle changes as well as the 300yd flag. Also depending on the wind direction the 500yd flag can be caught in a region with rather great turbulence. So following Bryan's advice in his book along with the mathematical data we've shown the 300 yard flag is generally the best flag to watch as is the mirage at this area. However while they are not as sensitive the outside flags still will give you a good idea of what is going on and since they are to the side you have an idea of what may be coming. The key here is to watch the flag that is upwind. If the wind is right to left watch the flag to the right as that is what is coming, the flag to the left is showing what has already happened. However for the beginning shooter it is easy to watch too much. So to keep stuff simple just watch the flag on the 300 yard line.

Now that we know what to watch lets try to interpret the data that we get from the flags in mirage. The first mistake shooters make with wind is they want to get their Kestrels out and measure the speed. From this you will get a value in mph then they will look in a drift table and come up with what the wind drift is. It may be nice to know but in a match that doesn't do you any good as you are watching flags not a wind meter. Also those drift tables assume that the wind is constant from muzzle to target and it never is.

The better approach is to not even think of wind in terms of mph, instead think of it in terms of MOA (minutes of angle). Why? Well because that is the unit you are using on your sights to adjust for it. If you talk to any experienced shooter they won't say they were shooting in 15mph that was gusting up to 20mph, they'll say I had 8 minutes on the rifle, with gusts up to 10.5moa (talking any rifle at 1000yds). Same way with the mirage talk about it in terms of MOA. Once you start shooting you will find out how much the wind is worth as the target will tell you.

So how much are the flags and mirage worth? Well that isn't as simple of a question as it seems. There are two things that come into play the actual speed of the wind and the direction of the wind to the shooter. First we will talk direction.

When talking about direction we don't talk in terms of compass direction such as North, South, South West, etc. We talk in terms of full, half, or no values.

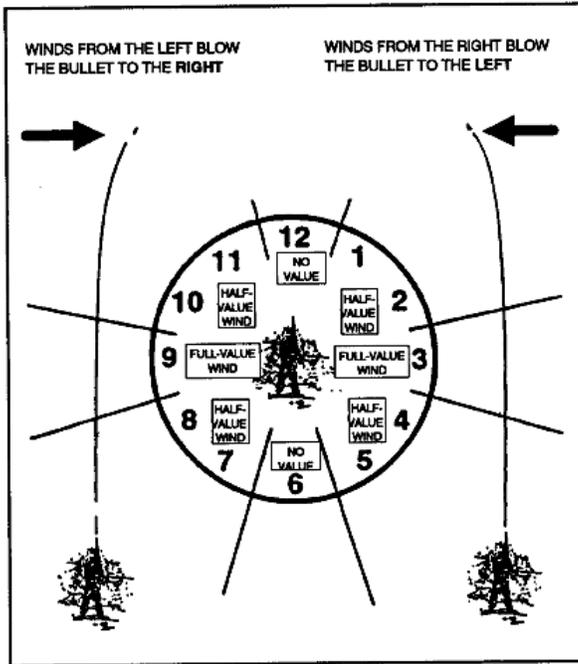
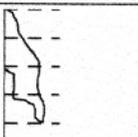
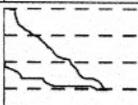
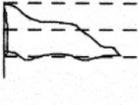
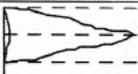
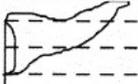


Figure 3-19. Clock system.

A full value wind is coming from 9o'clock to 3o'clock or vice versa. For interpreting wind speed we can use the following chart. Now how can we find the direction? Well we can simply look at the range flags. However you can also use your spotting scope. Put your scope out of focus so you can see the mirage then turn the scope around till you see the boil. The direction your scope is in, is the direction in which the wind is blowing. Earl Liebetrau taught me this trick a couple years ago at Camp Perry and works very nicely.

Standard Terms	Mph	Kph	Ft/ sec	Observations	Flag Description	Flag angle	Flag	Mirage Description	Mirage
Calm	0-1	0-2	0-2	Calm. Smoke rises vertically.	Flag hangs limply on the pole			Boiling. Streamers flowing upwards with no lateral movement	
Light Air	1-3	2-5	2-4	Light air. Smoke drifts slowly. Barely felt.	Flag moves to the lee side of pole			Leaning. Mostly upward movement, but starting to "lean" enough to clearly depict direction of wind	
Gentle	4	6	6	Slight breeze. Leaves rustle. Felt on face.	Flag lifts off the pole and flutters	15 degrees		Flowing gently. Clearly horizontal flow in big waves, moving loosely and slowly.	
Moderate	8	13	12	Moderate breeze. Leaves & twigs in motion.	Flag is definitely clear of the pole	30 degrees		Flowing rapidly. Streamers flowing horizontally with small waves, close together.	
Fresh	12	19	18	Fresh breeze. Small branches move.	Flag center-line is usually clearly visible	60 degrees		Slick. Mirage streaming quickly. Difficult to see changes. Flat-lining.	
Strong	16	25	24	Strong breeze. Small trees sway.	Flag is straight out and getting "starched"	90 degrees		Mirage gone	
Very strong	20	32	29	Very strong breeze. Large branches sway.	The fewer the ripples, the faster the wind	Above horizontal			

Now before we go farther lets add these two together. A full value 5mph is exactly what it sounds like. You are getting the full amount of the 5mph. Now lets say we have a 10mph wind that is half value. Well half value means your only getting half of 10mph. So a half value 5mph is the same as a full value 5mph. But we talk MOA not mph so how do we find out what mph equals what in MOA? Well experience over time lets you do this, but to start off here is a chart you can use for a starting point.

	Any Rifle	Palma
600yd	3.1	4.4
1000yd	6	9

The above is for a 10mph wind and will give you a starting point. Your cartridge and bullet combination may vary. Now do note the above diagrams are just general and it depends on your rifle. It is important to know the difference because Palma shooters tend to be better wind readers. If you know what they say they think they will need and you know the difference between your rifle and theirs it can be an aid.

So now that we have an idea to interpret what the flags are telling us how do we use this data? Well the first thing you need to do is make a guess as to what you think the wind is worth. You look at the flags and say I think its worth 2MOA, you may want to talk to other shooters to see what they are going on with. What you are doing here is trying to match the data you are seeing (theoretical) with the data you

receive on the target (experimental). After you shoot your first sighter you then adjust, to get everything matched up. As we talked about before you want to get your gun "on-call" with the wind. As you adjust your windage you readjust the mental image to say when the flag/mirage does this it is worth "X" amount.

Now that we have the initial wind condition figured out we may want to start our string. Very rarely does the wind ever stay constant, it will change. When this happens a shooter will have a couple of options.

1. Shoot fast and try to adjust through the changes (chase the spotter)
2. Waiting for a specific condition.
3. Read the flags/mirage and adjust off of what they tell you.

Either method works in some situations better than others (will talk about that later).

However, when you make changes you need to know what your windage is when you make the shot. A lot of shooters will think in terms of how much they just changed. If you see shot plots of some shooters you will see .5, .25, .25, -.5, 0, 0, -1, etc. This is showing how much they changed. The problem with thinking like this is if the wind comes back to its initial condition you really don't know how much you have on the rifle. If the wind makes a quick change then you are either going to have to figure out where you are at windage wise, or just use some SWAG and hope you are right. The better way to think about wind is instead to think in terms of how much you have on the rifle. Say we start with 2MOA, then in our minds the above would be come 2.5, 2.75, 3, 2.5, 2.5, 2.5, 1.5. The quick change comes up, you then know you have 1.5MOA on the rifle and you need to put a .half back on. Using this method further allows the shooter a way to learn what that flag/mirage look means wind wise.

Above we talked about three different ways to handle the wind. Lets discuss the pro's and cons.

#### 1. Chasing the Spotter

Pro's- if you have a no wind or very steady wind condition with minor changes of 1MOA or less you can keep up with the condition. You don't have the issues of stopping and then wondering what the wind value is as you are always with the condition.

Con's- If the hard pick up or let off comes or worse yet a reversal you are going to lose points as you won't see it. Using this method you never really learn to read the wind. On a day where the wind is changing a lot you can easily get behind the wind. If you don't have fast pit service you can't keep up with the wind.

#### 2. Waiting for a specific Condition

Pro's- Shooter doesn't have to worry about getting lost in his/her windage as your are shooting in a certain condition. You are keeping an eye on the flags for big changes, if it happens you stop so you

don't get caught. Works well if you have a no or steady wind condition or if there are pickups and let offs.

Con's- Sometimes a condition may not come back and after waiting a long period of time you may be hard pressed for time to get rest of your shots in. Plus there is no guarantee that condition will come back. Sometimes there may be other factors out there that the flags and the mirage aren't showing you so you may "think" you have the same condition but you don't.

### 3. Doping off the flags/mirage.

Pro's- you are making predictions off of observable changes. You are learning what flag/mirage value equates to how much wind. If your flags are changing directions you are going off of what they tell you.

Con's- Need experience to do this. You must keep track of how much windage you have on your rifle as easy to get lost.

So which of the above methods is best and which is the worst?

Overall the best method to use is a combination of all three of them. In a repeatable pattern, which we will share. Some days we may chase the spotter more, some days we may read more, but generally successful shooters will use all three methods. The important thing is to have a pattern that can be applied at any distance, and any range regardless of the wind conditions and pit service.

1. We take our sightsers get the rifle on call. Knowing how much wind is on the rifle

2. Look at the flags/mirage

3a. Looks the same as previous take the shot and call it.

3b. Wind direction changes slightly or speed changes slightly adjust and take the shot and call it.

3c. Big wind direction change or speed change, wait till it calms down. Look at your neighbors targets to see how much they were blown this will give you an idea.

3c1. If it doesn't calm down make the adjustment and take a shot and call it. Sometimes you do just have to make a SWAG. If it is good or bad put it in the memory bank so next time you know if it worked, or what it should have been.

3c2. If the condition comes back take the shot and call it.

4. After the rifle comes out of recoil watch the flags for any change and load a round.

5. Target comes up make the appropriate change for how far off call you were, close the bolt, repeat and follow steps 2 through 5.

The one thing you need to be careful of is if you are hammering the 10's and X's don't forget step 4. It is easy to forget this and as a result drop a 9 after running a string of 10's and X's.

### Tricks of the trade

As you get more experience you will learn little tricks of the trade for reading wind but here we will share them with you.

1. If the match has limited sighters talk with your neighbors find out what they are shooting and using for windage. This way it will give you an idea of what to go on with.
2. Don't be in a hurry to shoot your sighters, if you know what your neighbor is going on with let him shoot first see what he comes up with and then make a change before you shoot your sighter. This will help in sighters but also during a string if you notice a big change. Turn the ears on you may here him/her say what their wind dope will be see if that works before you do it. However a special warning, only do this with experienced shooters. A novice shooter won't help you at all.
3. Have your spotting scope set so you can see the targets upwind. At 1000yd you can see about 10 targets through your scope. If you keep an eye on this you can sometime see a change coming before it hits your targets.
4. Pay attention to your neighbors shot cadence if you hear him/her holding up look at the flags. There may be something different happening down there.

Before we finish we should address the situations of head wind and tail wind. A head wind will cause the bullet to rise and a tail wind will cause the bullet to go lower. It takes a fair amount of wind to do this and if you experience it it will generally take you out of the X ring into the 10 ring or tight 9 ring at most. However the wide elevation 9's, 8's, and 7's shooters will see in head and tail wind conditions are not due to wind. It is general because of poor shooter follow through which we have addressed in a previous section.