Reading a Weather Map

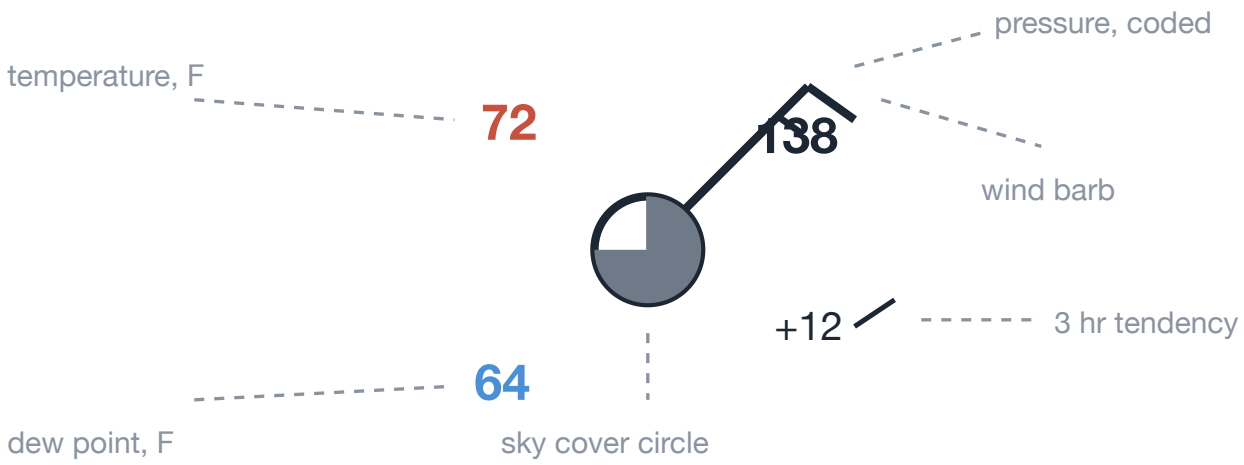
By the rock. August 27, 2026. Grounded in National Weather Service definitions.

The short version

Each cluster of numbers on a professional surface map is a station model: one observing site's whole report drawn in shorthand. Temperature sits upper left, dew point lower left, the circle in the middle fills in with sky cover, the barbed stick flies with the wind, and the three digit number upper right is sea-level pressure with its front chopped off: put a 9 or 10 back on, whichever lands nearer 1000, and add a decimal before the last digit. Learn the one dot and a real Weather Prediction Center surface analysis stops being wallpaper and starts being hundreds of simultaneous eyewitness reports.

The dot is a sentence

Open a real surface analysis, the kind the Weather Prediction Center publishes every few hours, and past the fronts and pressure lines you will find it peppered with small circles trailing numbers and little barbed sticks. Each one is a station model: a single observing site's full report, temperature, moisture, wind, sky, pressure and its recent history, packed into a thumbnail-sized glyph. The layout never changes. Learn it once and every dot on every surface map for the rest of your life reads as a sentence.



One station, fully decoded below: 72 over 64, mostly cloudy, wind from the northwest at 15 knots, sea-level pressure 1013.8 millibars and rising. A dot that says all that has earned its ink.

The left side: temperature over dew point

Upper left is air temperature, lower left is dew point, in Fahrenheit on US maps. The pair travels together on purpose, because the gap between them is a reading in itself: a wide spread means dry air

and room for the day to swing, a narrow spread means loaded air, poor visibility, fog risk at night, and fuel if something comes along to lift it. When a present weather symbol is plotted, rain dots, snow stars, fog dashes, it sits between them on the left, so the whole left column reads as what the air holds and what it is currently dropping.

The circle: how much sky

The circle in the middle is sky cover, filled in by fraction: empty for clear, quarters and halves on the way up, solid black for overcast. The fractions are the same eighths-of-the-dome system the okta lesson covers, drawn as pie. A circle with a second ring around it means calm wind, which brings us to the stick.

The barb: which wind, how hard

The staff flies FROM the direction the wind comes from, like a flag streaming in reverse: a staff running to the northwest means a northwest wind. Speed reads off the feathers at the staff's far end, in knots: a half barb is 5, a full barb 10, and a filled pennant 50, added together. One full barb and a half is 15 knots. Two pennants, a barb and a half would be 115, and would also mean you should be reading this from somewhere else.

The pressure trio, and its missing front end

Upper right is sea-level pressure, and it looks broken: three digits, like 138 or 992. The code chops off the front of the number and keeps tenths of a millibar. To restore it, put a 9 or a 10 back on the front, whichever lands the result nearer 1000, then set a decimal before the last digit. So 138 becomes 1013.8 millibars, and 992 becomes 999.2, not 9992. It works because sea-level pressure so rarely leaves the 900s and low 1000s that the leading digits carry no news.

Just below or beside it rides the tendency: the pressure change over the last three hours in tenths of a millibar, with a small line sketching the shape, rising, falling, or falling then rising. Why that little number is worth a whole lesson of its own is covered in the falling glass; on the map, a cluster of stations all showing steep falls is a system announcing itself in real time.

Assembling the picture

Now zoom out on the full analysis. The long lines with triangles and half circles are fronts, and the fronts lesson owns their grammar; the smooth curves labeled in millibars are isobars, whose meaning, tight packing means wind, belongs to why the wind blows. The station models are what makes those big strokes honest, because you can check the drawing against the dots. Behind that cold front, do the stations really show falling temperatures, rising pressure, and northwest barbs? Ahead of the low, are the temperature and dew point pinching together under filled circles? A surface analysis is not a picture OF the weather; it is an argument built on a few hundred sworn witnesses, and now you can cross-examine them.

Find your own dot

Today, whatever the sky is doing: search for the Weather Prediction Center's latest surface analysis, WPC surface analysis will find it, and locate the plotted station nearest your home. Before you decode it, predict it: write down what you think it will say for temperature, wind direction, and sky. Then read

the dot: corners, circle, barb, pressure trio. Then the final check, which no other subject offers its students: walk to the window and see whether the country's official map agrees with your actual sky. When they disagree, remember the map's dot is an observation from a fixed site some miles from your window, taken at the top of the hour. Both witnesses are honest. They are just not standing in the same place.

Check your understanding

1. On a station model, the number in the upper left corner is:

- ☐ A. Pressure
- ☐ B. Air temperature
- ☐ C. Wind speed

2. A wind barb's staff runs toward the southwest from the circle, with one full barb and one half barb. The wind is:

- ☐ A. Blowing toward the southwest at 15 knots
- ☐ B. Coming from the southwest at 15 knots
- ☐ C. Coming from the northeast at 25 knots

3. The coded pressure on a station reads 992. The sea-level pressure is:

- ☐ A. 992.0 mb
- ☐ B. 999.2 mb
- ☐ C. 1099.2 mb

4. The station circle is completely filled in. That reports:

- ☐ A. Heavy rain
- ☐ B. An overcast sky
- ☐ C. Night time

5. Several neighboring stations all show pressure tendencies near -25. Reading the map, that cluster means:

- ☐ A. Their barometers share a defect
- ☐ B. A system is approaching that part of the map
- ☐ C. High pressure is building there

Answer key

1. On a station model, the number in the upper left corner is:

B. Air temperature — Temperature upper left, dew point lower left. The pair is plotted together because the gap between them is a reading in its own right.

2. A wind barb's staff runs toward the southwest from the circle, with one full barb and one half barb. The wind is:

B. Coming from the southwest at 15 knots — The staff flies FROM the wind's origin: a staff pointing southwest means a southwest wind. A full barb is 10 knots and a half is 5, summed: 15.

3. The coded pressure on a station reads 992. The sea-level pressure is:

B. 999.2 mb — Prepend 9 or 10, whichever lands nearer 1000, and set a decimal before the last digit: 9 plus 992 gives 999.2. Prepending 10 would give 1099.2, nowhere near Earth's surface pressures.

4. The station circle is completely filled in. That reports:

B. An overcast sky — The circle is sky cover, filled by fraction of the dome, the same eighths the okta system counts. Solid means overcast; precipitation gets its own symbol to the left.

5. Several neighboring stations all show pressure tendencies near -25. Reading the map, that cluster means:

B. A system is approaching that part of the map — Steep three hour falls across a region are a low or front announcing itself; the tendency field shows a system's approach before the isobars finish redrawing. The falling glass lesson is that story at one station.

Questions people actually ask

Where do I find a real surface analysis?

The Weather Prediction Center, part of the National Weather Service, publishes surface analyses for North America every few hours; searching WPC surface analysis gets you there. Choose the versions with station plots to see the dots this lesson decodes.

Why are station model temperatures sometimes different from my app?

The station is a fixed instrument site, often an airport miles from you, reporting the top-of-the-hour observation. Your app interpolates and updates continuously. Treat the station model as sworn testimony from one exact place and time, which is precisely its value on a map.

Why knots instead of miles per hour?

Surface observations grew up alongside aviation and marine practice, which run on nautical miles. One knot is about 1.15 mph, so a 20 knot barb is roughly a 23 mph wind. The barbs' arithmetic, 5, 10, 50, is the reason forecasters can read wind fields at a glance.

What are the little symbols between temperature and dew point?

Present weather: standardized marks for what is falling or obscuring at observation time. Dots for rain, stars for snow, horizontal dashes for fog, and dozens more. They only appear when there is something to report, so most fair days plot nothing.

Do forecasters still use hand-plotted maps in the satellite era?

Surface analyses are still drawn, fronts and all, by human analysts over the plotted observations, several times a day. Models supply guidance, but the analysis is a person's argument about where the boundaries ARE, checked against the station dots you can now read.
