

IC4.3: Tennessee River Valley fog near Savannah, TN

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Overview: Terrain-induced microclimates are common across the Memphis WFO County Warning Area (CWA). A few examples of the microclimates are fair-weather cumulus clouds that develop over Crowley's Ridge in Northeast Arkansas, lower high and low temperatures in the Tennessee River Valley, and a Mississippi River breeze that develops on hot summer afternoons near West Memphis, Arkansas. For this exercise, I will focus on the microclimate of the Tennessee River Valley in the vicinity of Savannah, Tennessee.

Savannah, Tennessee is small town located on the eastern bank of the Tennessee River within the valley. The elevation of Savannah is around 440 feet. Savannah is surrounded by hilly terrain with some peaks as high as 1000 feet within 25 miles to the east (near Collinwood, see Figure 1). A small drainage comes into Savannah from the higher terrain to the southeast (see Figure 2). There are other drainages all throughout the Tennessee River Valley from the higher terrain to the east and west of the river.

The town of Savannah, and even other towns along the Tennessee River Valley like Clifton, Decaturville, and Paris, will often have lower temperatures and a higher frequency of fog than surrounding areas within the Memphis CWA. The lower temperatures are likely a result of cooler air draining into the Tennessee River Valley from the surrounding terrain. The higher frequency of fog is likely due to the substantial water source (Tennessee River) along with the cooler temperatures.

Synoptic-scale Ingredients: The best times to observe the cooler temperatures across the Tennessee River Valley would be any cloudless night. Clear skies for this region often occur when a strong high pressure moves in behind a cold front. The winds across the region will go calm as the sun sets in the evening and a low level inversion will form. Cool air will begin to drain into the Tennessee River Valley. Fog occurs more frequently in the valley than the rest of the Memphis CWA due to the cooler temperatures and large water source. Fog can occur across most of the region in the fall through spring as high pressure moves in after a rain event. Fog usually forms a night or two after the rain event, once high pressure settles in and the clouds from the previous system finally move east. These low clouds can hang around for a day or two after the rain if the upper level low is slow to move out of the region. There is a higher probability of dense fog for the Tennessee River Valley after a rain event due to the enhanced moisture from the river.

Diagnosis and Prognosis: Experience suggests that locations within the Tennessee River Valley will usually see lower high and low temperatures than surrounding towns across the Mid-South. Experience also suggests that the GFS model does not forecast temperatures low enough across the Tennessee River Valley. The operational MOS guidance seems to do a better job when compared to the GFS. As a general rule of thumb, I usually lower the low and high temperatures 4 to 6 degrees than the surrounding areas from the GFS forecast and 1 to 2 degrees from the MOS guidance. There is also another type of MOS guidance that forecasts high and low temperature forecasts for cooperative observer sites (<http://www.nws.noaa.gov/mdl/synop/coop.php>). The closest site to Savannah is Savannah 6 SW (SAVT1). One problem with the MOS guidance for Savannah 6 SW is that the site is on the other side of the Tennessee River, closer to Shiloh. I have not been able to use this website yet while composing my forecast; however I did notice that this MOS product seemed to be even closer to what was actually observed. In the future, I might try to look at this secondary MOS product and incorporate it into my forecast grids.

Figure 1: This is a map of WFO Memphis County Warning Area. The shaded colors depict the elevation. The yellow is around 1000 feet, the dark blue is around 500 feet, and the light pink is around 200 feet. The Tennessee River Valley is highlighted with the red circle.

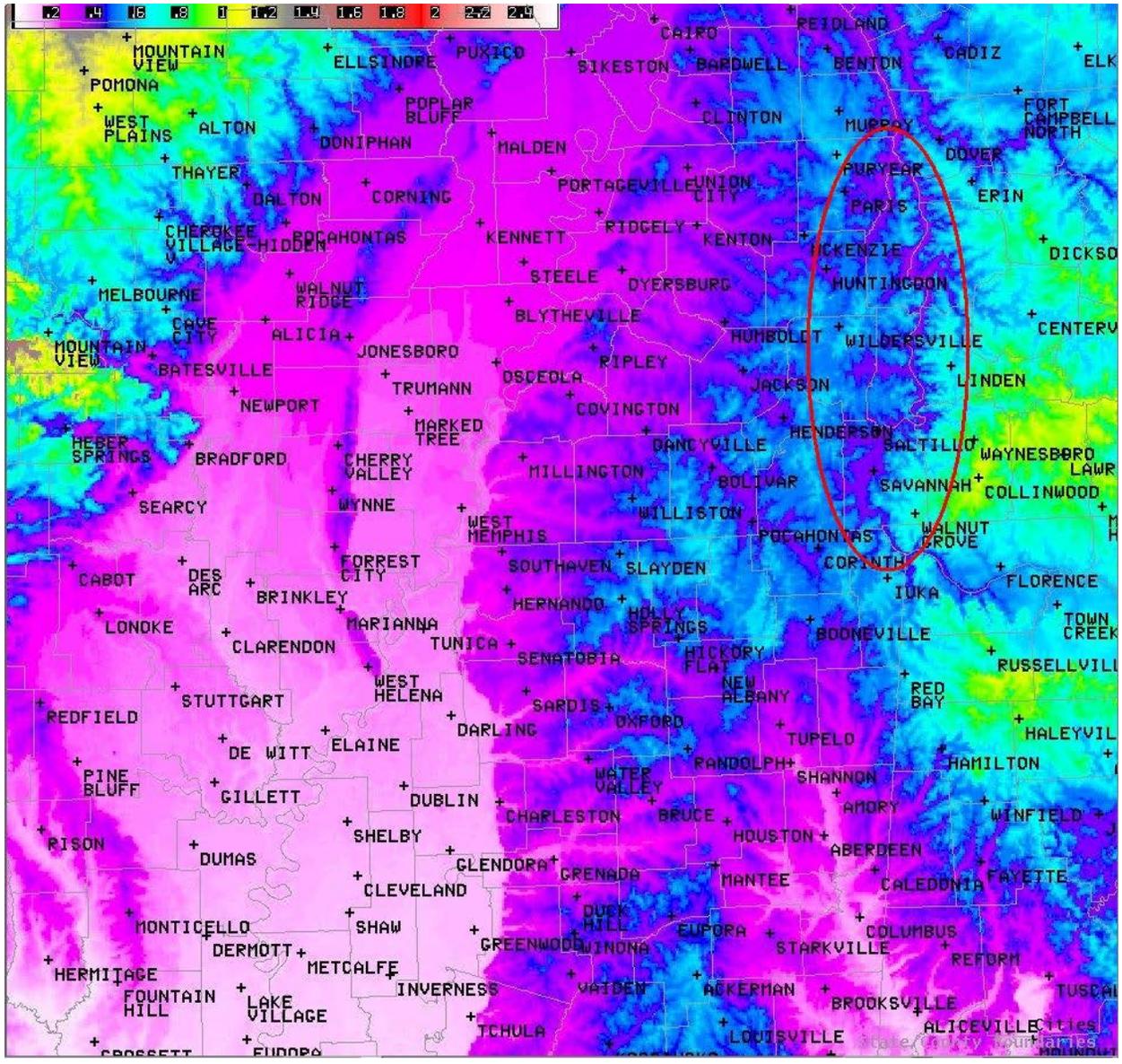


Figure 2: A closer look at Savannah, TN and areas in close proximity. Savannah, Shiloh, and the cool air drainage are circled in red. The yellow is around 1000 feet and the purple is around 500 ft.

