Ag Blog 21June 2021

During the 2021 growing season, Dr. Eric Hunt of Atmospheric and Environmental Research, Inc. will be providing weekly updates of the soil moisture index (SMI) from the Noah-MP version 4.0.1 land surface model in the NASA LIS framework for the entire U.S. and regional analysis of the SMI over the four regions of U.S. where the majority of corn, soybean, wheat, and cotton production occurs. Additionally, soil moisture index maps of South American and western Russia are provided at the end of the blog. The analysis is intended to provide the larger agricultural and meteorological communities insight as to areas where soil moisture is excessive or deficient compared to average for that location and what that may mean for impacts. It is my goal that these maps can be an early warning signal for flash drought development or where flash flooding could be likely in the coming week if heavy precipitation materializes. Please be advised that the SMI should be viewed as complementary, not a substitute, to the U.S. Drought Monitor (USDM) and that declarations of drought or flash flood potential for a particular location should never be based on the SMI alone. Various other maps that help give insight into current conditions across the U.S will also be shown as needed.

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Order of Maps and Tables in today's Ag Blog

- Figure 1. CONUS Soil Moisture Index map
- Figure 2a. Driest Grid Points
- Figure 2b. Wettest Grid Points
- Figure 3. U.S. Drought Monitor
- Figure 4. Flash Drought Watch update
- Figure 5. Recent CoCoRAHS precipitation
- Figure 6. South America Soil Moisture Index map
- Figure 7. Western Russia/Ukraine Soil Moisture Index map

Narrative:

A significant portion of the U.S. had an SMI below 0 as of last Thursday, with a non-trivial number of locations having soil moisture that put them in the bottom 20th percentile (i.e., SMI < -3; Figures 1-2a). This is especially true over the western U.S., where severe to exceptional drought is dominant (Fig. 3), and the northern Plains/upper Midwest region where many places are in severe to extreme drought according to the latest U.S. Drought Monitor.

For the past few weeks, I have been showing a map of where the most rapid drying of soils had occurred over the previous three weeks. The areas that stand out most with rapid decline of soil moisture in the 0-40 cm layer between the 27th of May and 17th of

June in Figure 4 are over western Wyoming, western Montana, eastern Idaho, with clusters of rapid drying in the High Plains over western North Dakota and a little further south into Nebraska and Kansas. Over western North Dakota, the gains that were made in mid-to-late May have essentially been wiped out and the forecast for the next few weeks up there isn't particularly favorable. The drought situation in the northern plains is a major factor in the horrendous rating for spring wheat, with only a quarter of the U.S. crop in good shape.

If there is some good news in today's blog it's that some places that needed the rain have got some since the NLDAS data cutoff for the maps generated. This is particularly true over southern Iowa, southern Wisconsin, northern Illinois, and southern Michigan. In the Great Lakes region this rain won't end the drought but combined with seasonally cool temperatures expected in that area this week, it certainly may warrant some modest improvement. Further south in Illinois where drought was less of a problem but recent dryness was, significant rainfall over the weekend should help the crops as they start marching toward the all-important reproductive stage. Helpful rain did fall across the northern half of Iowa as well but not in as significant of quantity.

A quick survey of the latest Crop Progress report doesn't necessarily paint a bad picture for corn and soybean in Iowa but it's not exactly rosy either. I would have to assume though that some of the crops in the northwestern quadrant of Iowa are struggling and will need adequate moisture for the remainder of the season to hit higher yields. A lack of precipitation and more days over 100F in the next month will likely guarantee corn yields will be no better there than in 2020, if not somewhat worse. Further to the west across Nebraska, beneficial rains did fall in some places since the cutoff, but not as widespread as further east. Given the recent dryness and heat, it is likely pivots in the irrigated country west of Lincoln were on last week, which would explain most of the state's crops being in good condition. A visual survey from gravel roads of the mostly rainfed crops north and east of here yesterday showed that the corn is mostly in good shape, with some fields having very high potential, but a few more days in the upper 90's with no moisture and that yield potential will begin to plummet. Further to the north in the Dakotas, a miracle is probably needed for above trend corn and my guess is yields in 2021 will be the lowest they've been since 2014.

An official forecast for corn will be released next week after more rigorous analysis but right now my expectation for U.S. corn is to yield in the 178-180 bushels per acre range. However, that number is also not far from what I think is a ceiling, so my assessment is based on some optimism for continued rains in the 'I' states with irrigation keeping Nebraska solid. There is still a realistic chance that corn ends up below 170 bpa.

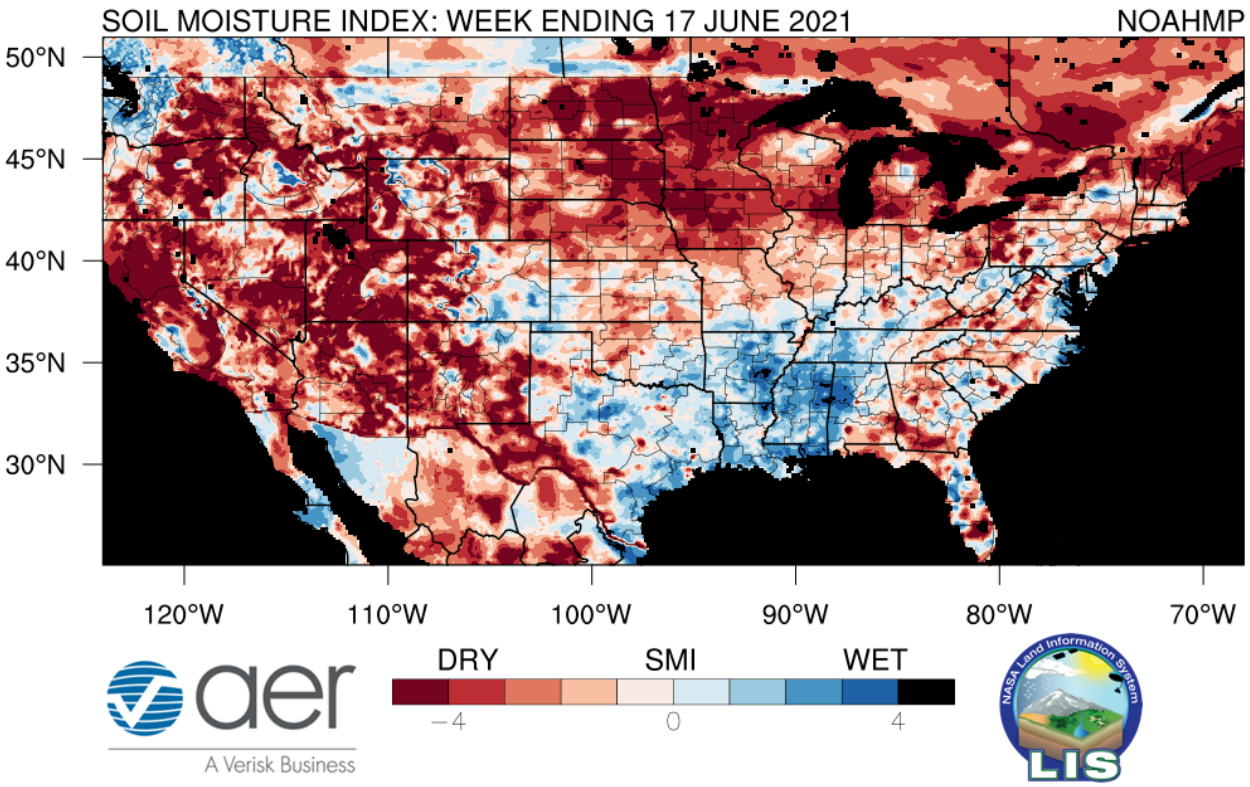

Figure 1. The Soil Moisture Index (SMI) for the 7-day period ending 17 June 2021. Results are based on output from the 0-1 m (surface to 3.23 feet) layers in the Noah-Multiparameterization (Noah-MP) land surface model. Noah-MP is run in the NASA Land Information System (LIS) framework with the North American Land Data Assimilation Version 2 (NLDAS-2) forcing dataset. The SMI calculation is based on the soil moisture index created in Hunt et al. (2009) such that '5'(dark blue) is the wettest and '-5' (dark red) the driest for the period of record. The period of record used calculate the SMI for the current map is 1979-present.

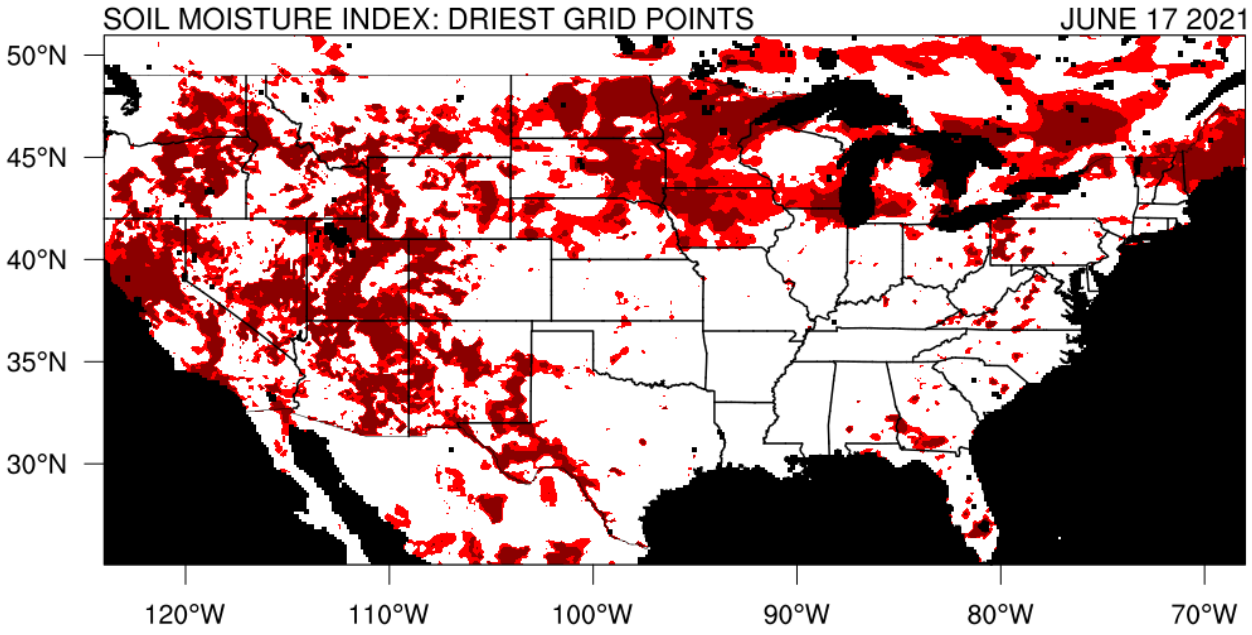

Figure 2a. Lowest 20th (10th) percentile of soil moisture as depicted by red (dark red) pixels for the week ending 17 June 2021.

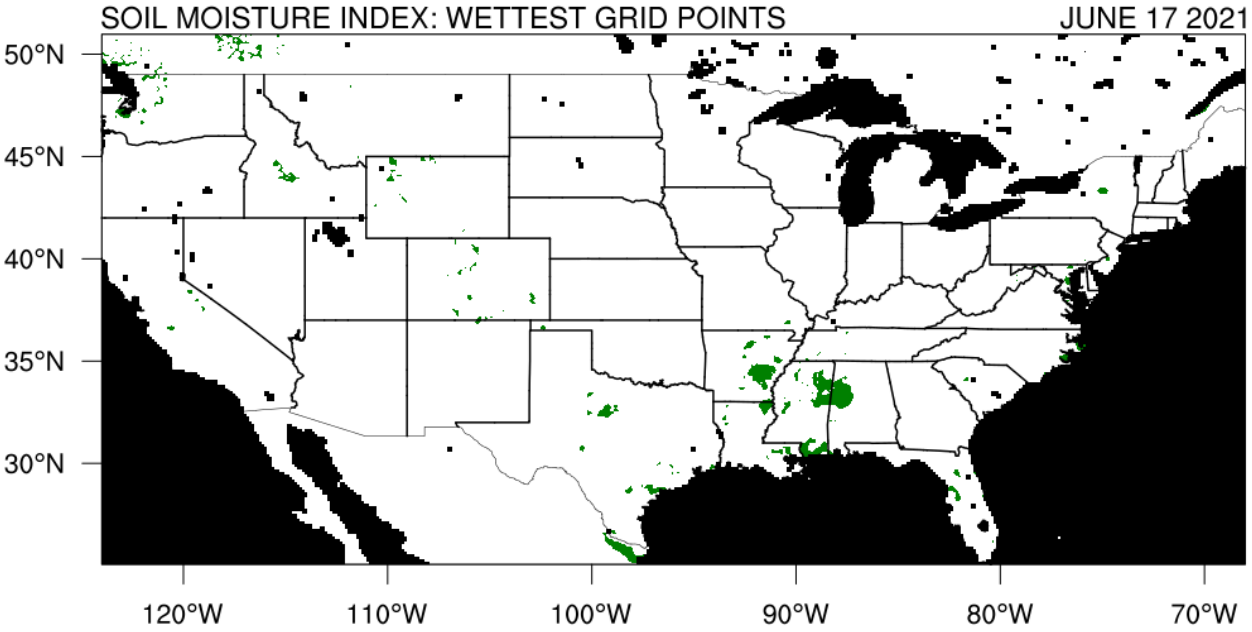

Figure 2b. Highest 20th (10th) percentile of soil moisture as depicted by green pixels for the week ending 17 June 2021.

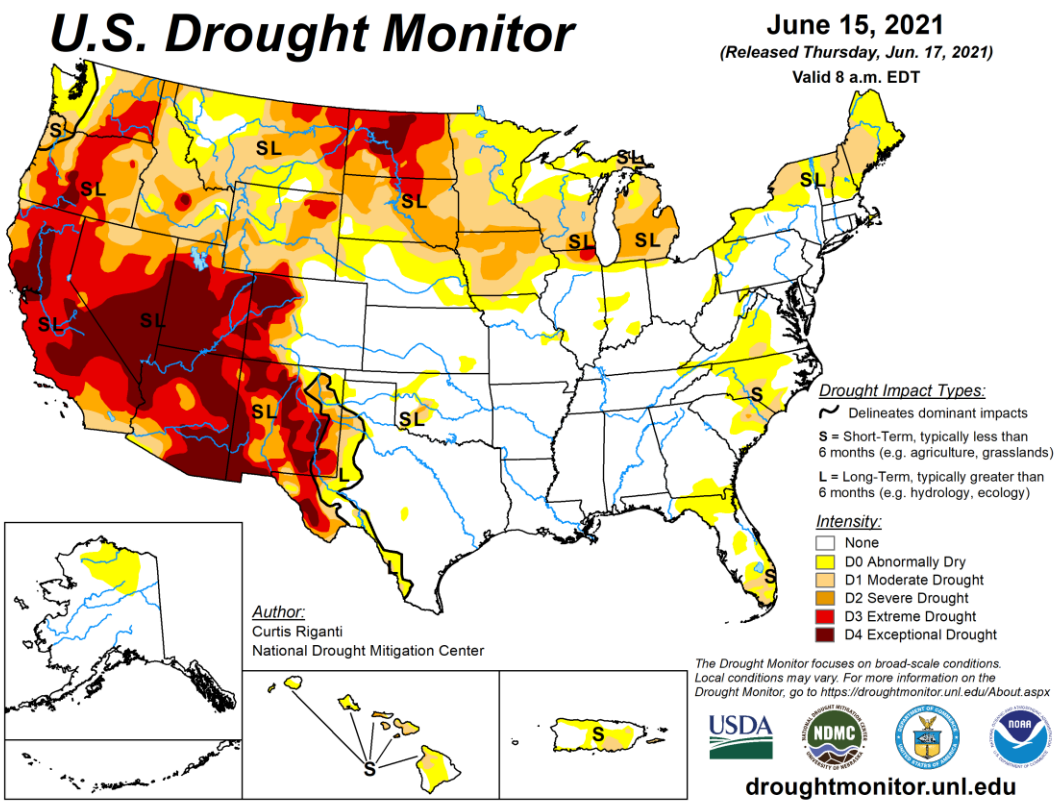

Figure 3. U.S. Drought Monitor map as of 15 June 2021. Map courtesy of the National Drought Mitigation Center.

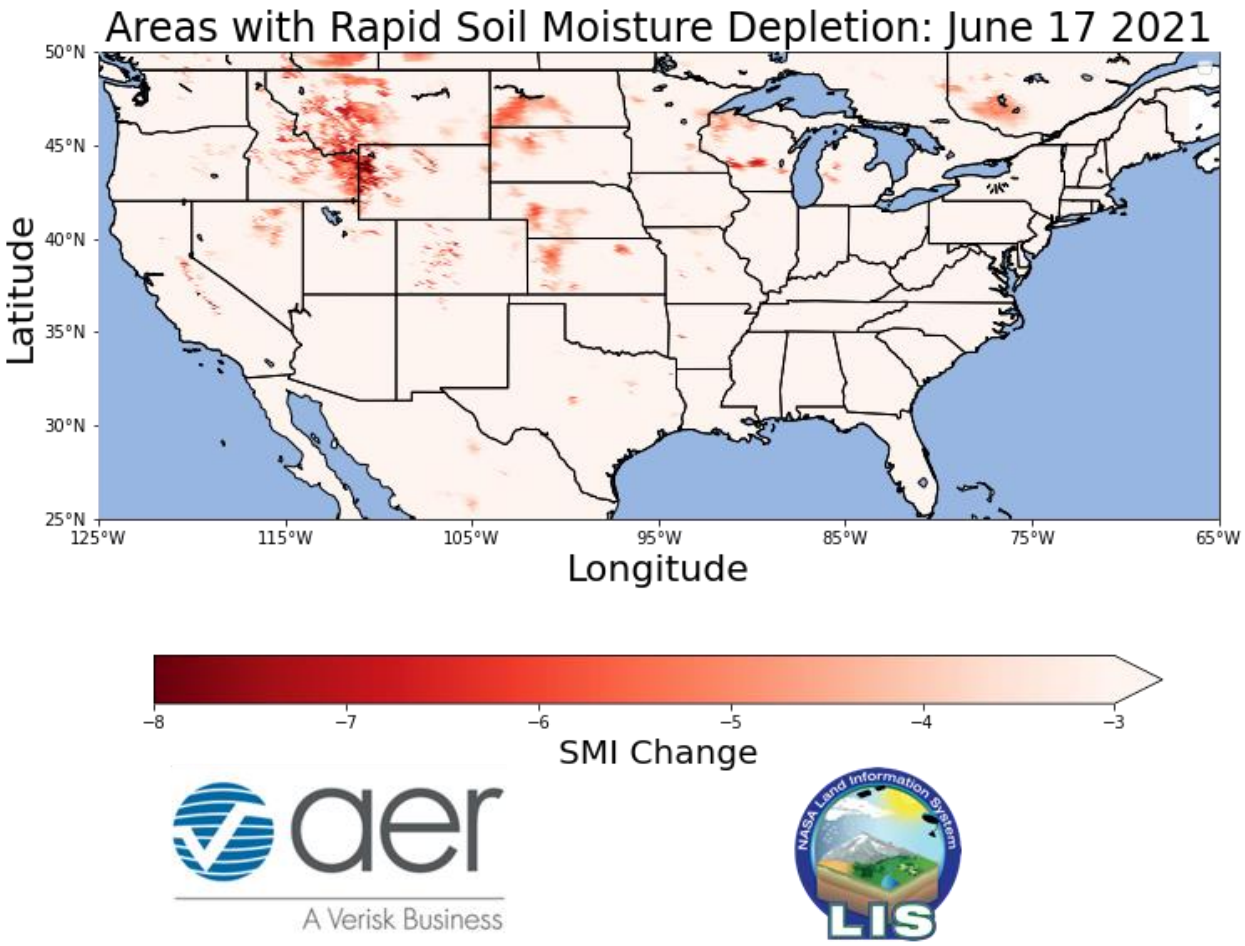

Figure 4. Areas to watch for flash drought as of 17 June 2021. The experimental product is based on a portion of the Flash Drought Intensification Index, which was proposed in Otkin et al. (2021). The criteria are as follows: A minimum drop of -3 in the SMI over previous 3 weeks and a current SMI of < -2. In this case, the SMI is based on the 0-40 cm layers from NASA LIS. For more information, refer to Figure 1.

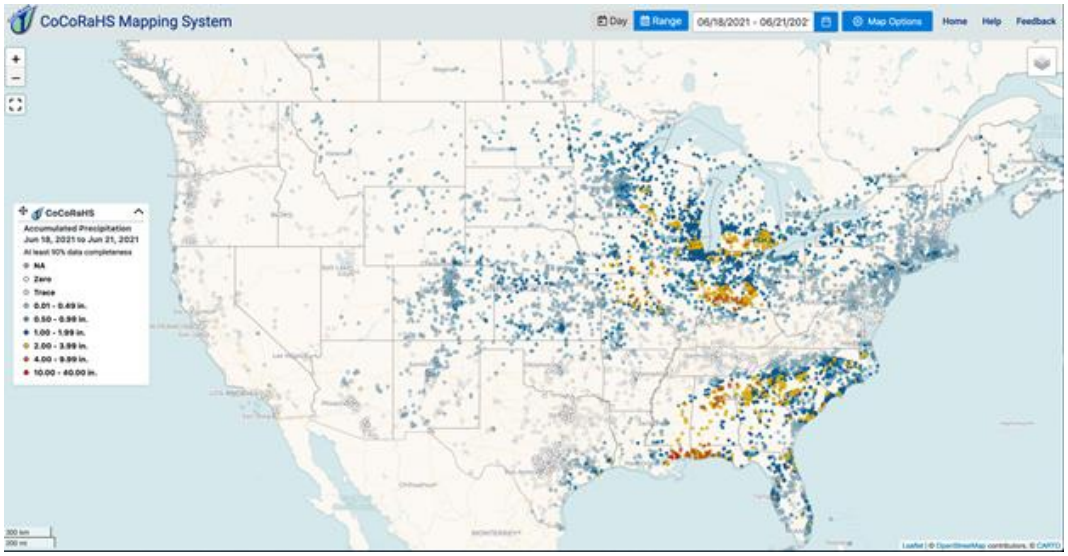

Figure 5. Screenshot of CoCoRAHS reports of accumulated precipitation over CONUS between Friday, 18 June and Monday, 21 June.

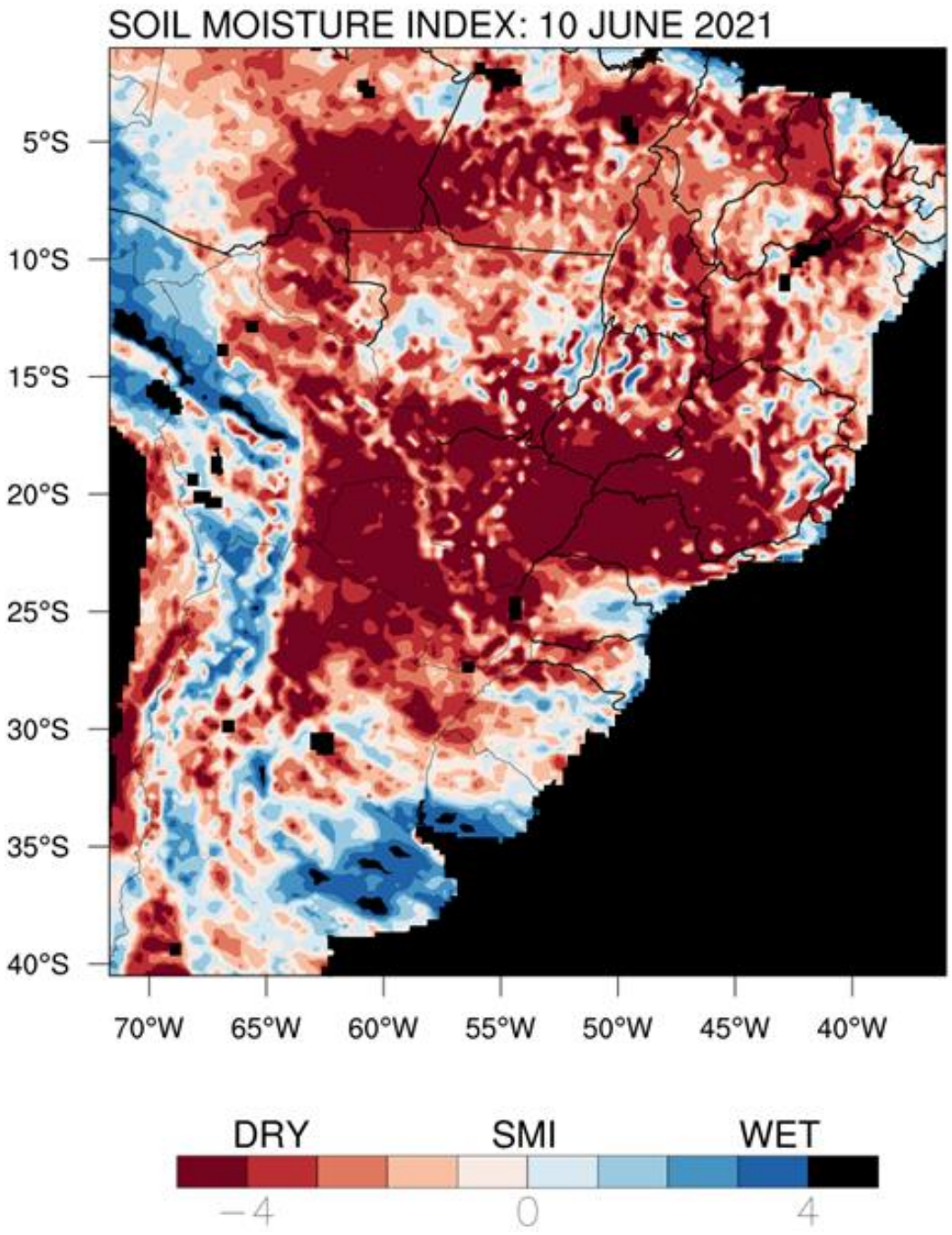

Figure 6. Soil moisture index (SMI) map) for the 7-day period ending 17 June 2021 over South America. Refer to the caption in Figure 1 for more details.

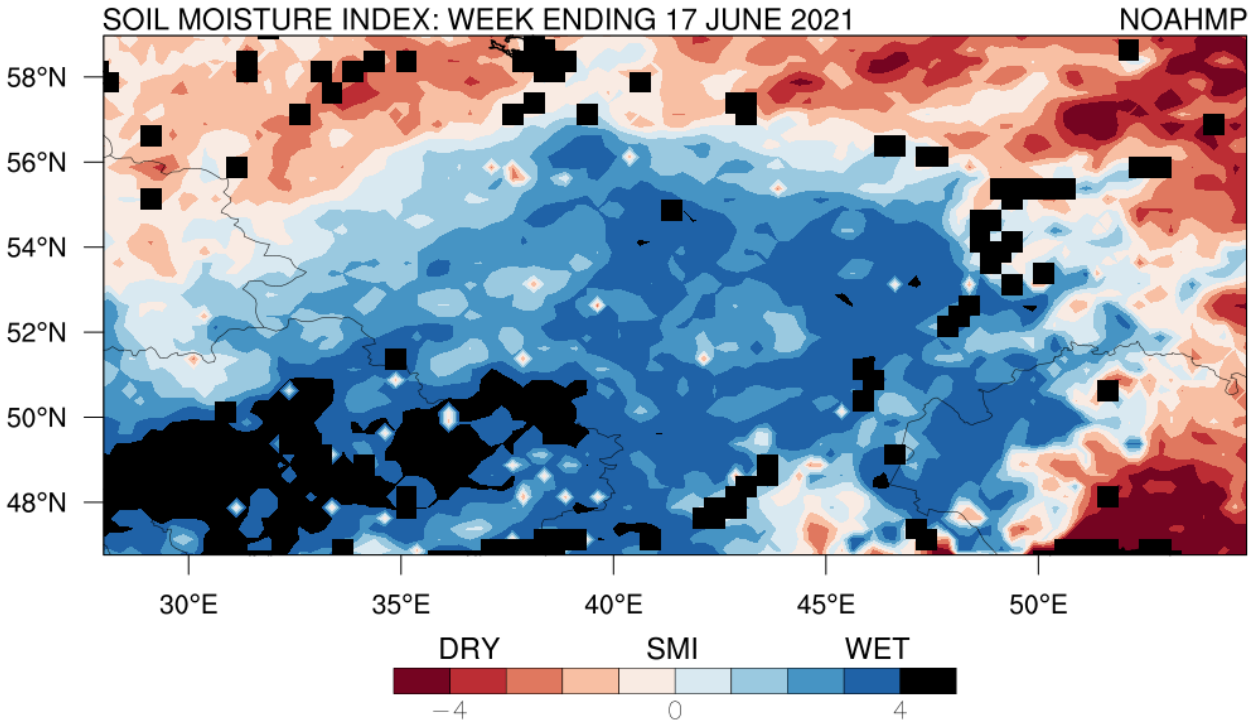

Figure 7. Soil moisture index (SMI) map) for the 7-day period ending 17 June 2021 over western Russia, Ukraine, and northwestern Kazakhstan. Refer to the caption in Figure 1 for more details. Black squares are missing data points.

About the author:

Eric Hunt is an agricultural climatologist from Lincoln, NE and has several members of his extended family actively farming in Illinois and Nebraska. Eric has been with AER since 2012 and received his Ph.D. from the University of Nebraska. Among other activities, he is currently working on NASA funded projects to study the evolution of flash drought. He routinely blogs about agriculture and weather on the AER website. He can be reached via email at ehunt@aer.com and @DroughtLIS on Twitter.

About AER:

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