Ag Blog 15 June 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. The Evaporative Stress Index (ESI) and VegDRI will included in our analysis a bit later this season. 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

Narrative:

With the exception of the south-central U.S., which has been very wet, most of the U.S. had an SMI of below 0 as of last Thursday (Figure 1; Figures 2a-b). Conditions remain worst across the western U.S. the northern High Plains where the drought remains extreme to exceptional for many places (Figure 3). Concern for the Corn Belt should be growing as a good portion of the region is either in drought or has dried considerably in recent weeks. In our experimental "flash drought areas to watch" (Fig. 4), the main areas identified in southern Iowa, Nebraska, and western Illinois are on the periphery of existing drought.

As a reminder, the areas shown in Figure 4 are locations where the SMI has dropped by at least 3 (or 30 percentile points) over the past three weeks and where the SMI is currently below 2. Thus, these are areas that are in more immediate need of precipitation to avoid going into drought. This product is not designed to show places that are currently in drought so much as areas that may be cascading toward drought, though in some situations they may overlap. This will especially be true for areas with longer-term drought that had some recovery followed by recent rapid degradation.

The one area of the U.S. that isn't concerned about drought is the south-central region which has been very wet for most of the past few weeks. Further east, some improvement in dry conditions was noted in the Carolinas and parts of Georgia.

The latest Crop Progress report showed a solid start to the season for corn and soybean, though both saw %Good to Excellent ratings decline a bit. So far most of the issues seem to be in the northern Corn Belt but crop conditions will likely start to deteriorate across much of Iowa, southern Minnesota and into northwestern Illinois if rain doesn't materialize in the next 7-10 days. The rain that fell last Friday over the far western Corn Belt (eastern Nebraska) was very helpful for the rainfed crops and should help withstand the heat this week. Thankfully this spell seems shorter lived though it's doubtful that it's the last week with heat this summer. I haven't done a full analysis to project corn yield since our analog based projection back in late February. At that time the projection was for around ~180 bpa, or slightly above trend. Right now my feeling is that number is closer to the ceiling than the floor for yield potential but is still a valid projection.

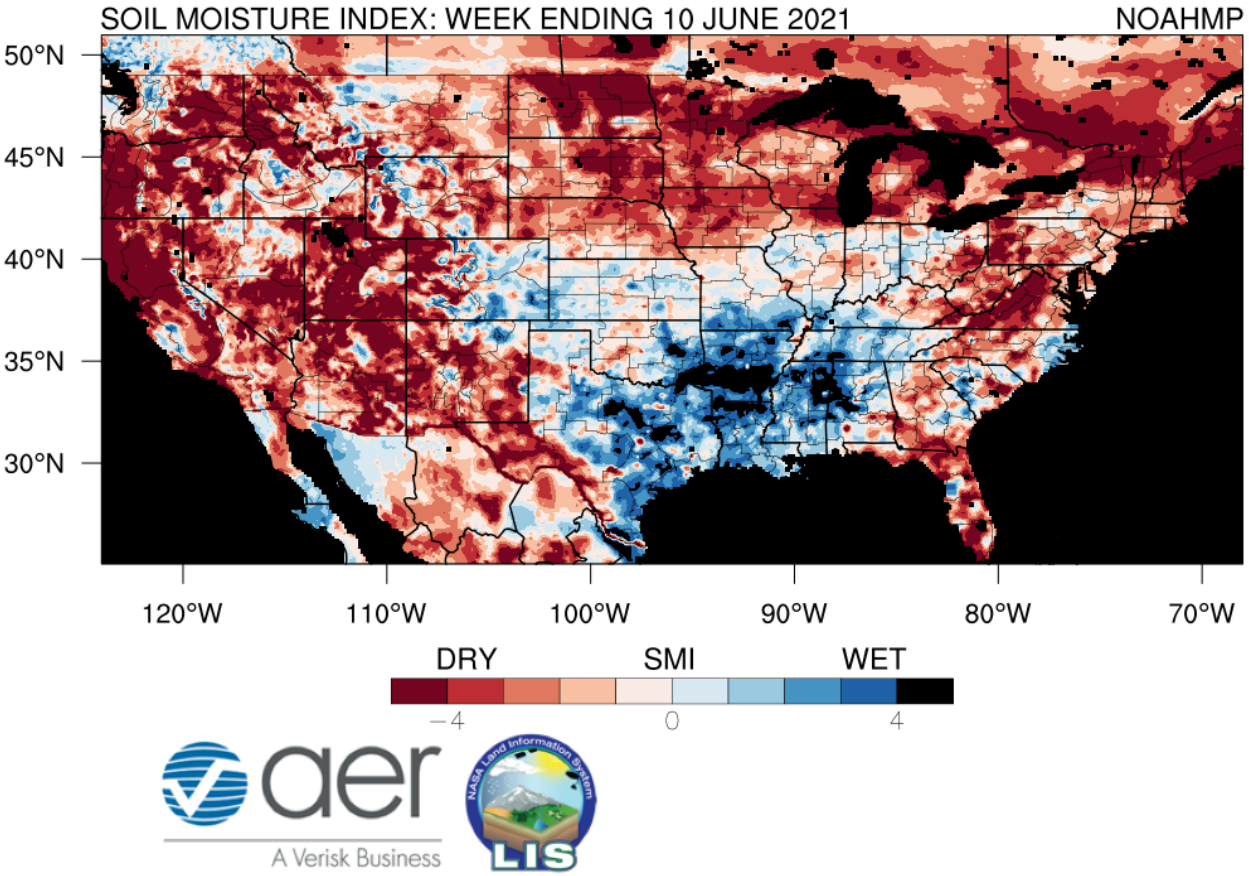

Figure 1. The Soil Moisture Index (SMI) for the 7-day period ending 10 June 2021. Results are based on output from the 0-1 m (surface to 3.23 feet) layers in the Noah-Multiparameterization (Noah-MP) land surface model. Noah-MP is run in the NASA Land Information System (LIS) framework with the North 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.

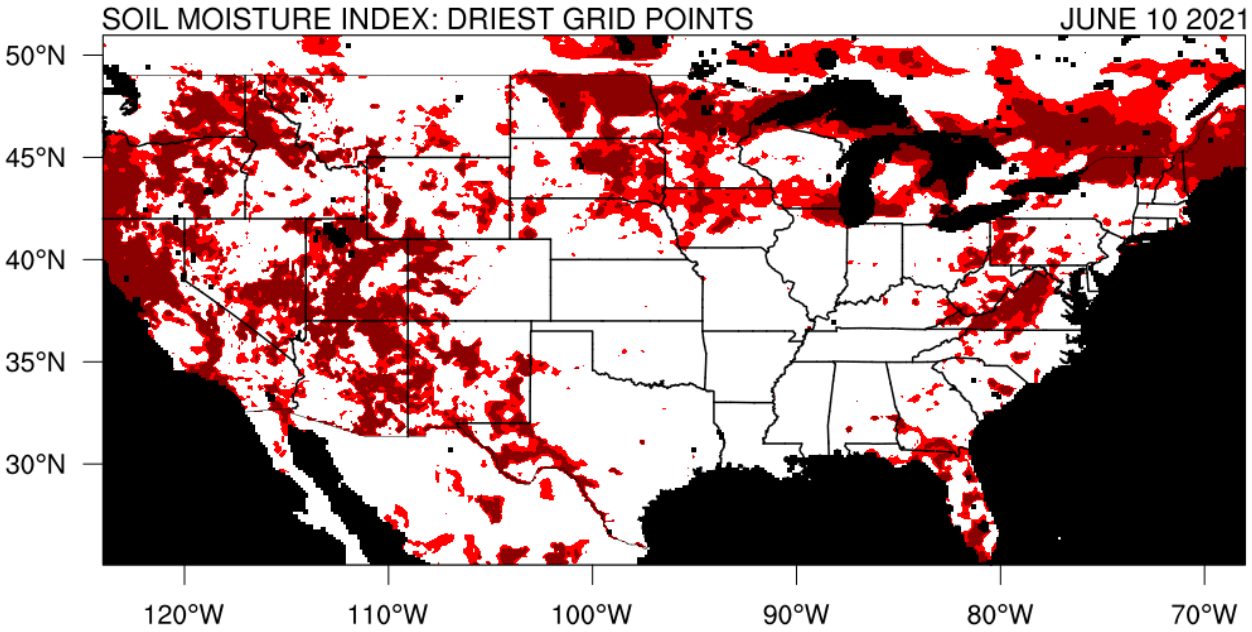

Figure 2a. Lowest 20th (10th) percentile of soil moisture as depicted by red (dark red) pixels for the week ending 10 June 2021.

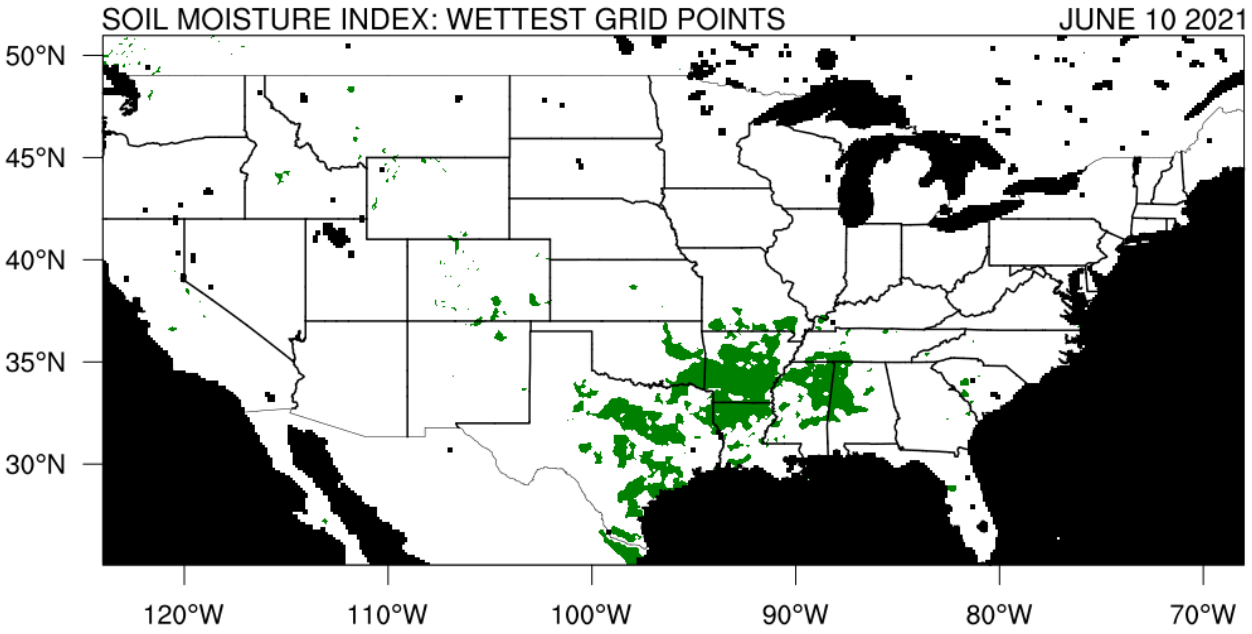

Figure 2b. Highest 20th (10th) percentile of soil moisture as depicted by green pixels for the week ending 10 June 2021

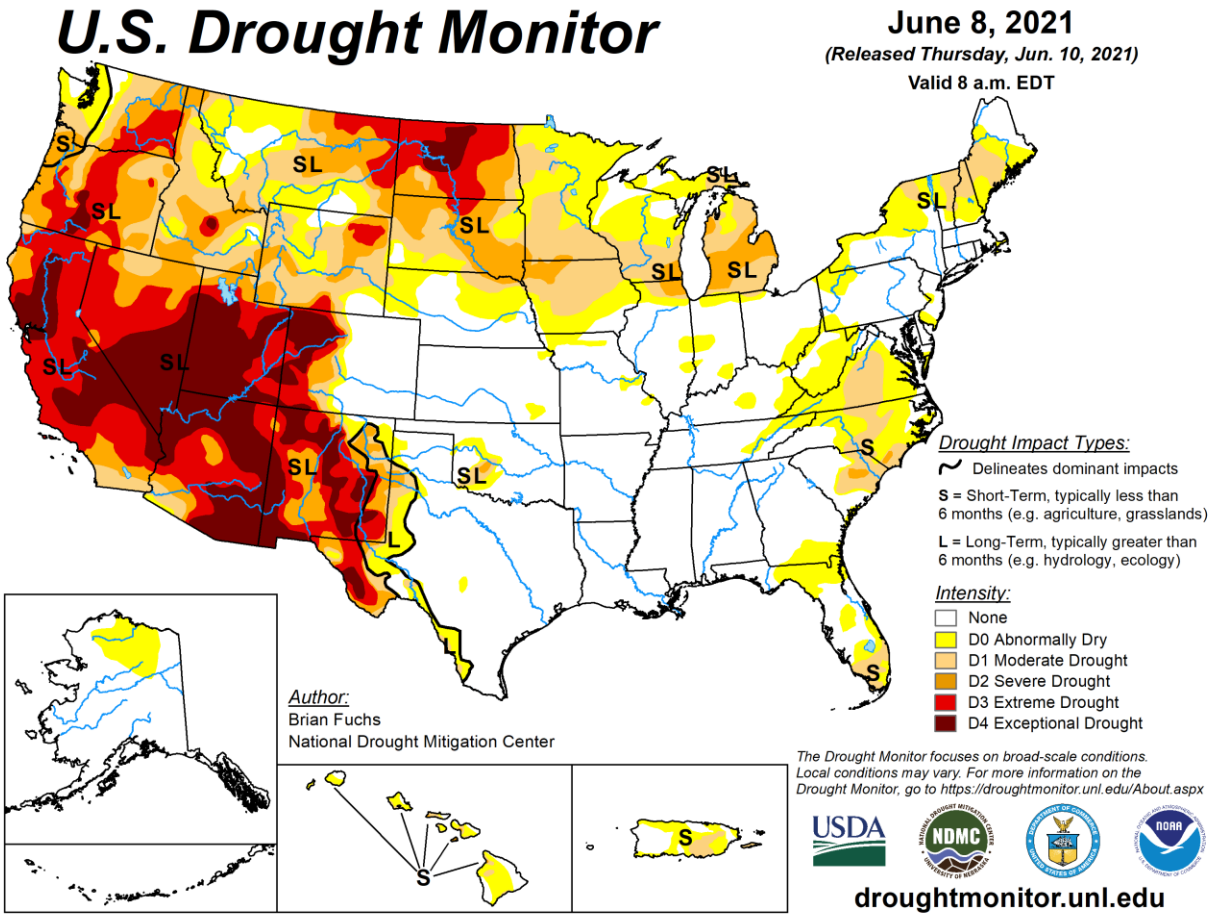

Figure 3. U.S. Drought Monitor map as of 8 June 2021. Map courtesy of the National Drought Mitigation Center.

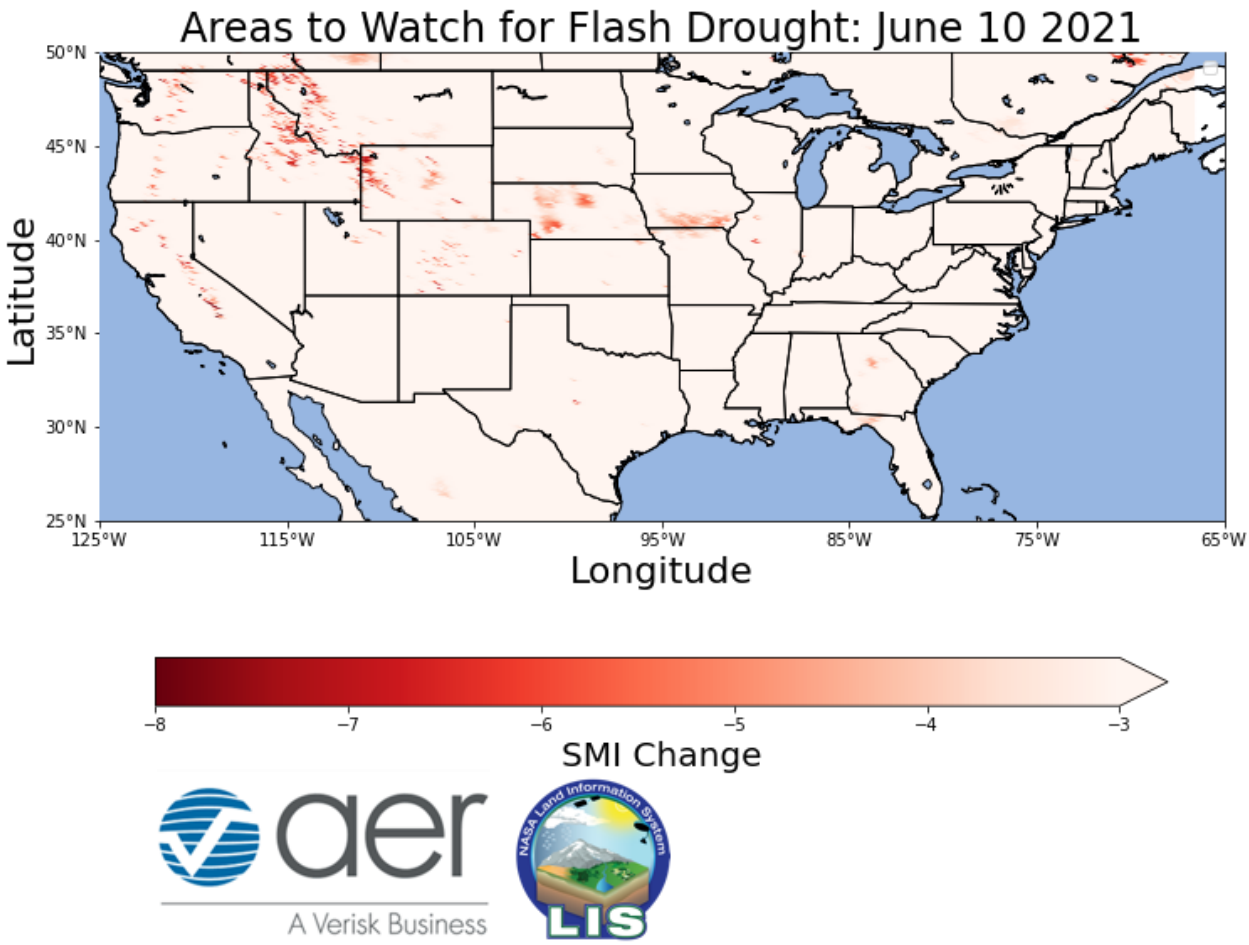

Figure 4. Areas to watch for flash drought as of 10 June 2021. The experimental product is based on a portion of the Flash Drought Intensification Index, which was proposed in Otkin et al. (2021). The criteria are as follows: A minimum drop of -3 in the SMI over previous 3 weeks and a current SMI of < -2. In this case, the SMI is based on the 0-40 cm layers from NASA LIS. For more information, refer to Figure 1.

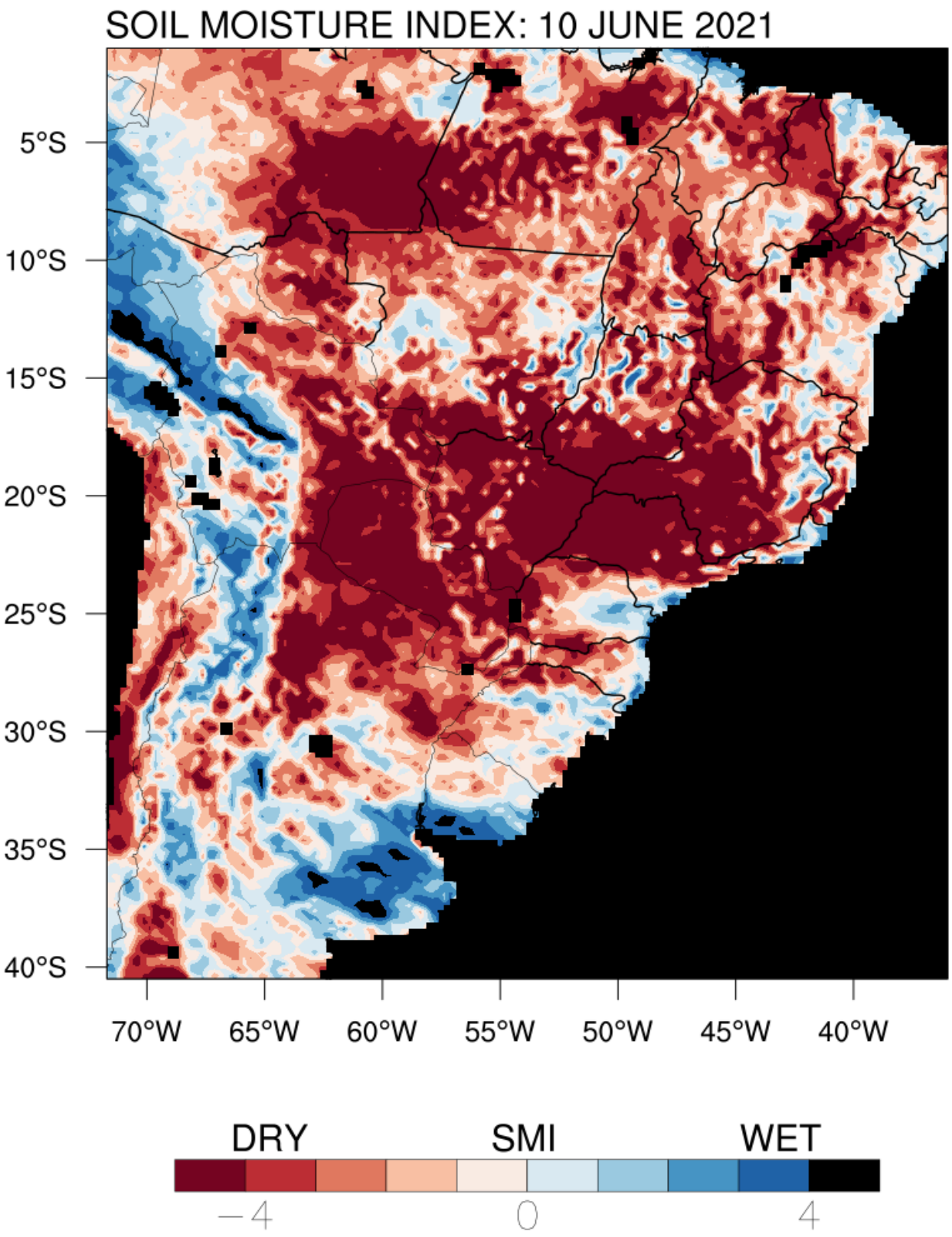
SOIL MOISTURE INDEX: 10 JUNE 2021
5°S
10°S
15°S
20°S
25°S
30°S
35°S
40°S
70°W
65°W
60°W
55°W
50°W
45°W
40°W
DRY
SMI
WET
−4
0
4

Figure 5. Soil moisture index (SMI) map) for the 7-day period ending 10 June 2021 over South America. Refer to the caption in Figure 1 for more details.

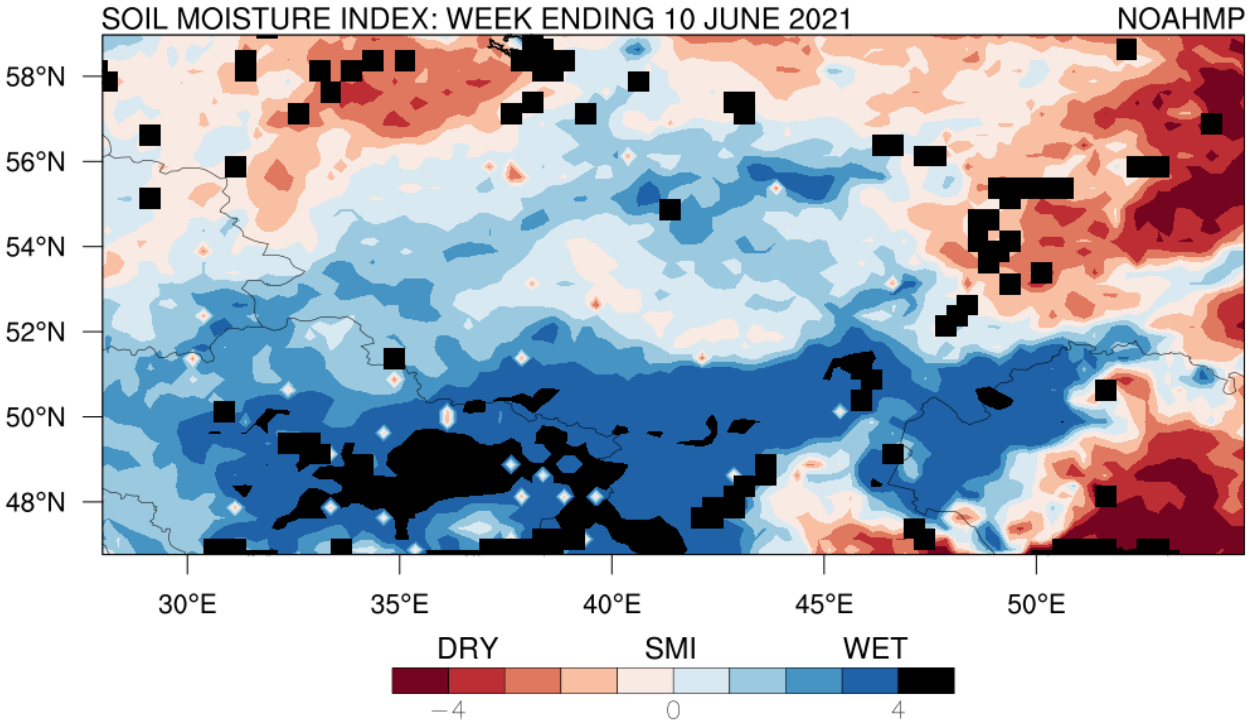

Figure 6. Soil moisture index (SMI) map) for the 7-day period ending 10 June 2021 over western Russia, Ukraine, and northwestern Kazakhstan. Refer to the caption in Figure 1 for more details. Black squares are missing data points.

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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