

Ag Blog 06July 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

Narrative:

As I mentioned last week, there would be big changes in the soil moisture index over parts of the central U.S. that received significant precipitation in late June. That has setup an impressive gradient of soil moisture anomalies across the Corn Belt, with Interstate 80 being roughly the transition in Iowa (Figs 1, 2a-2b). South and east of I-80 in Iowa and Illinois, soils are generally very moist and any heavy rainfall is not welcome at the moment. To the north and west, conditions generally remain on the spectrum from just a bit on the dry side to extreme drought (Fig. 3). The drought in the northern plains/upper Midwest has led to poor corn, soybean, and wheat crops in the Dakotas and into western Minnesota.

There is some good news though. First, it seems rather likely that the northern part of the U.S. Corn Belt will get some needed moisture in the next week and everyone should get some. For places that have had adequate moisture this should help keep a strong

reserve heading into the crucial time of year for corn and soybean and in some places in the northern Corn Belt, it could mean the difference between a significant loss in corn/soybean yield and salvaging an ok season. Second, Figure 4 doesn't highlight any areas where there was significant decline of soil moisture in the central U.S. So that means that the immediate risk of flash drought in areas where there is no drought is reasonably low. Third, there will be periodic shots of cooler air coming in over the next 7-10 days, helping keep crop water demand lower, reducing overnight respiration, and with decelerating the phenological development.

The news is less good in the west, where unprecedented levels of heat are accelerating and exacerbating the drought. The spring wheat crop in the northwestern U.S. is shaping up to be a disaster and no doubt the heat had highly detrimental impacts on fruit orchards, fish, etc...

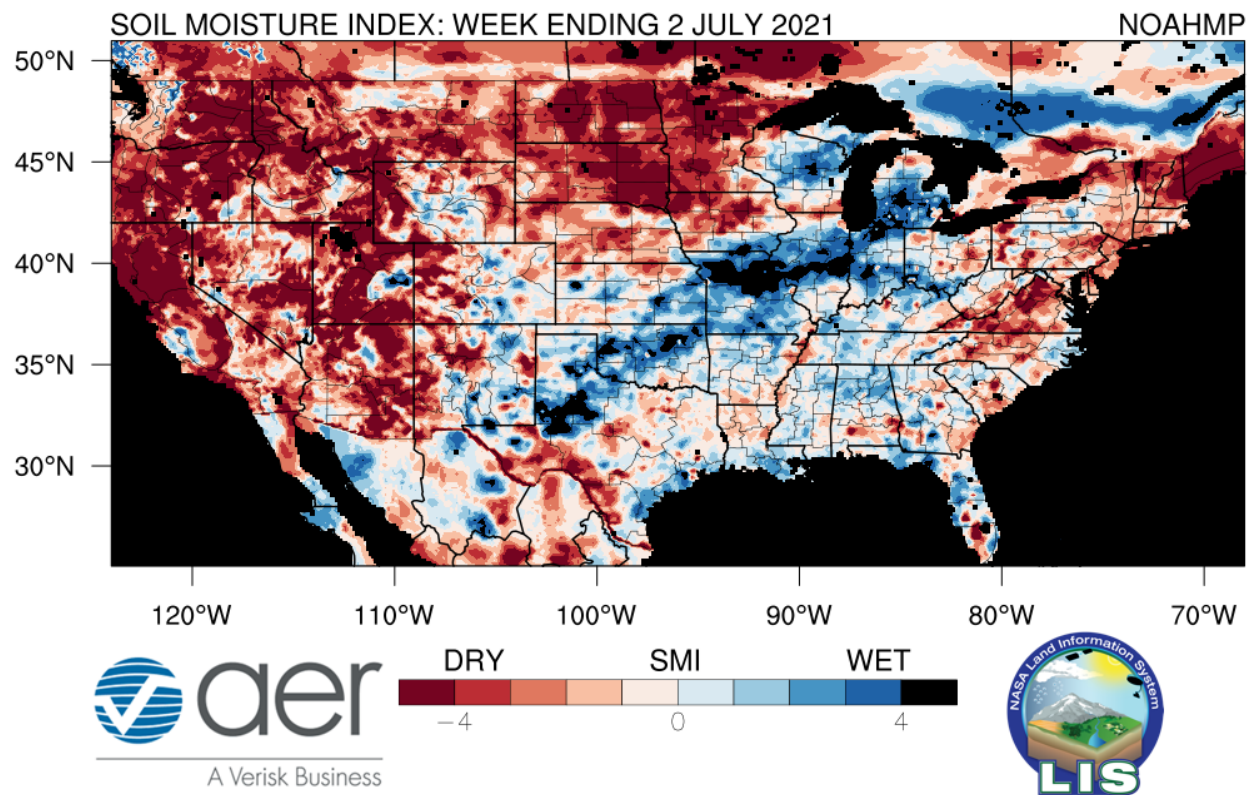


Figure 1. The Soil Moisture Index (SMI) for the 7-day period ending 2 July 2021. Results are based on output from the 0-1 m (surface to 3.23 feet) layers in the Noah-Multiparameterization ([Noah-MP](#)) land surface model. Noah-MP is run in the NASA Land Information System ([LIS](#)) framework with the 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 to calculate the SMI for the current map is 1979-present.

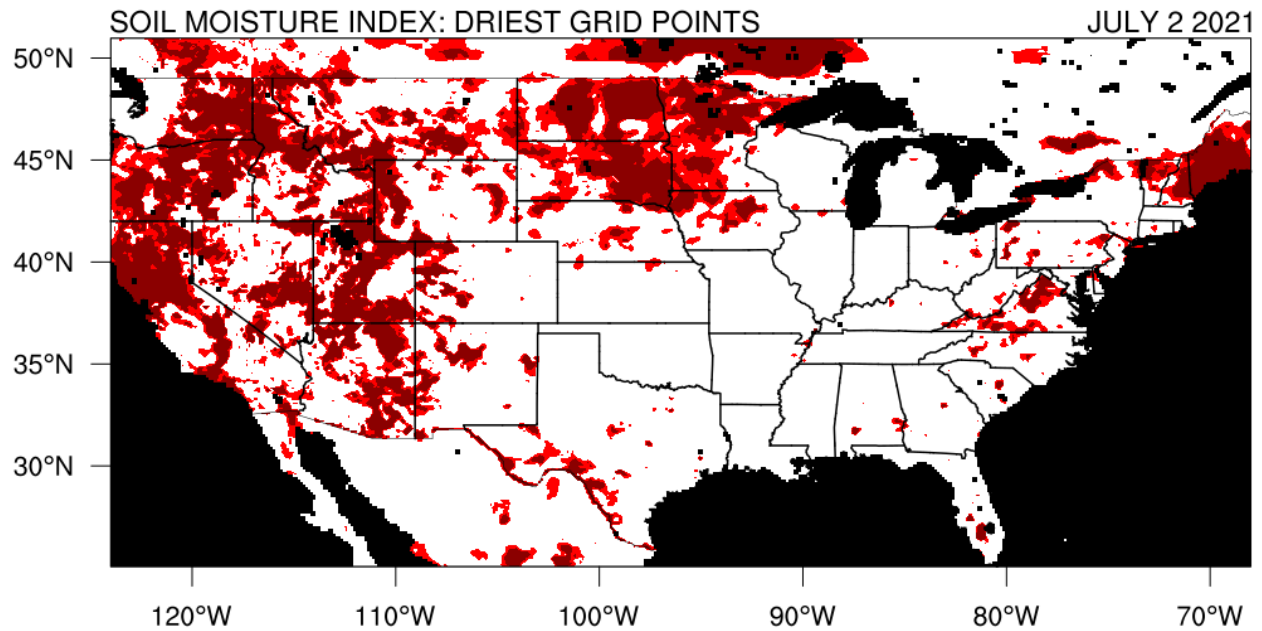


Figure 2a. Lowest 20th (10th) percentile of soil moisture as depicted by red (dark red) pixels for the week ending 2 July 2021.

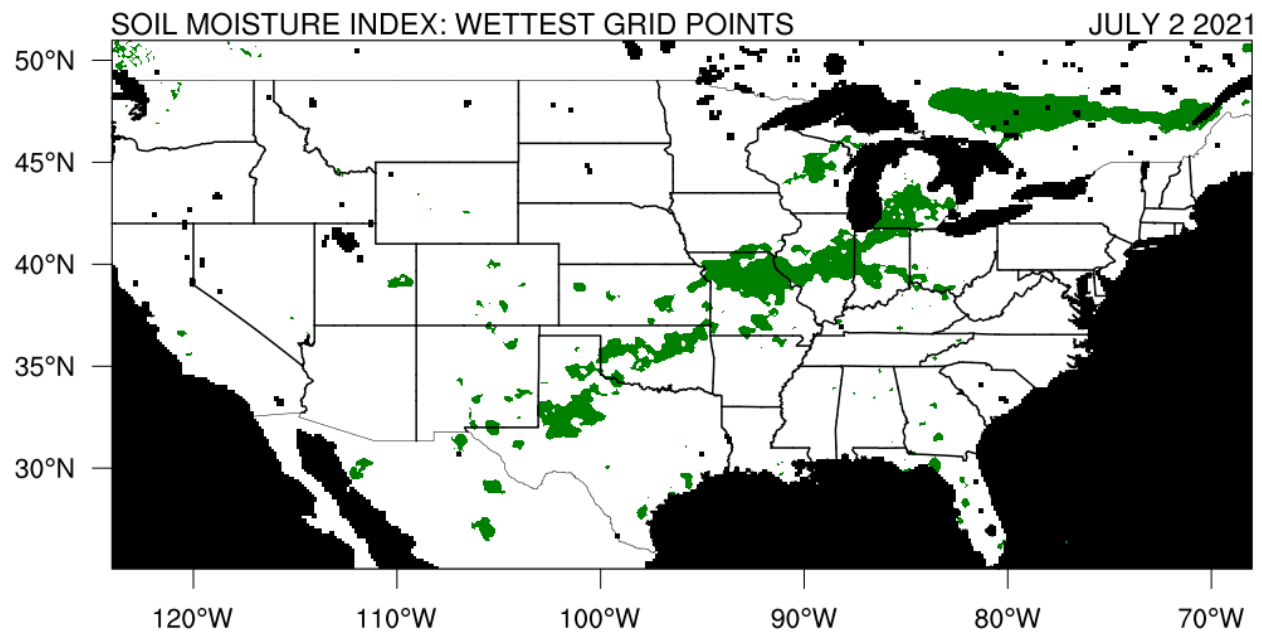


Figure 2b. Highest 20th percentile of soil moisture as depicted by green pixels for the week ending 2 July 2021.

U.S. Drought Monitor

June 29, 2021
(Released Thursday, Jul. 1, 2021)
Valid 8 a.m. EDT

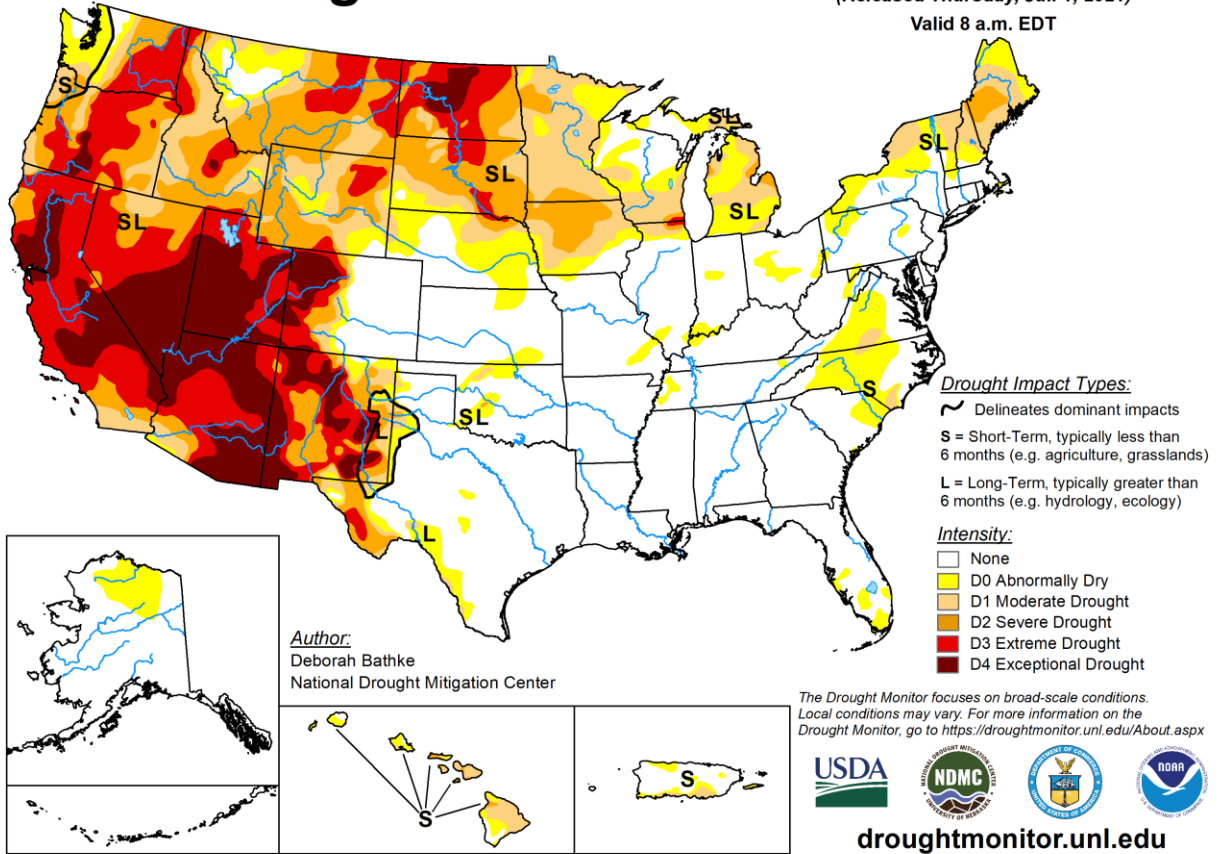


Figure 3. U.S. Drought Monitor map as of 29 June 2021. Map courtesy of the National Drought Mitigation Center.

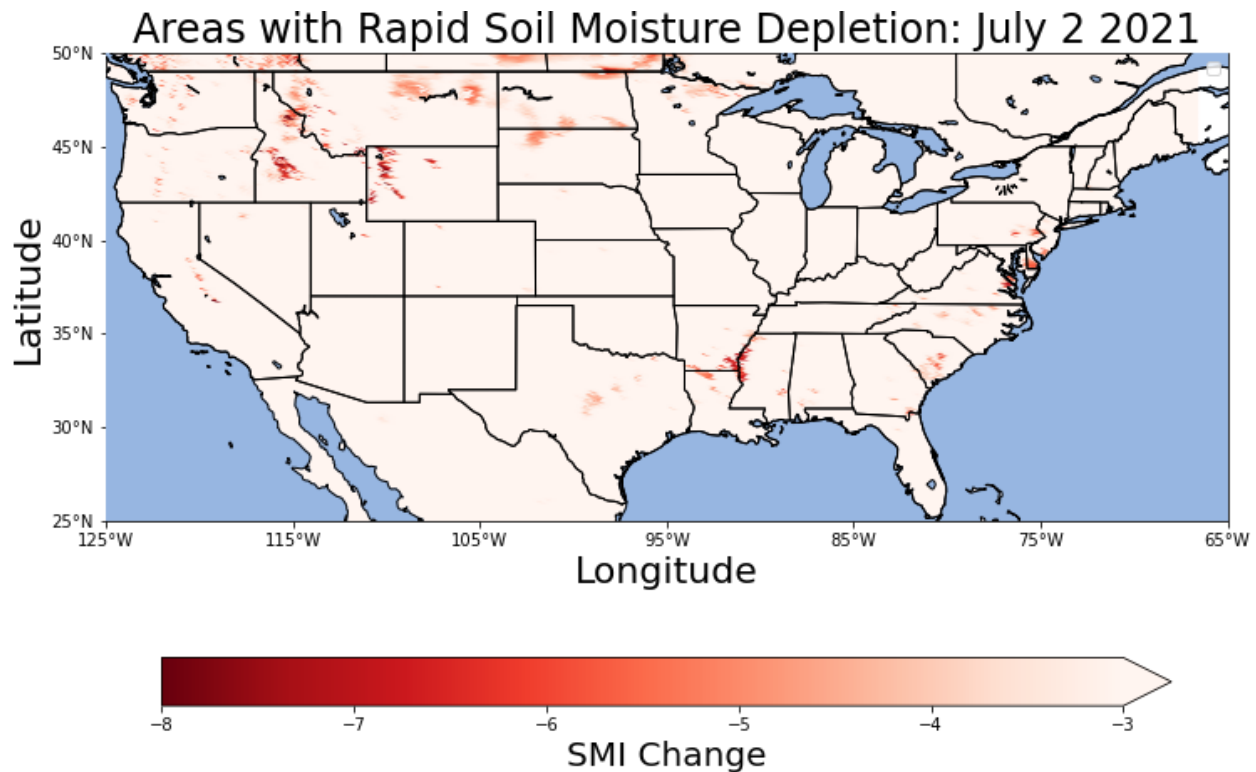


Figure 4. Areas to watch for flash drought as of 2 July 2021. The experimental product is based on a portion of the Flash Drought Intensification Index, which was proposed in [Otkin et al. \(2021\)](#). The criteria are as follows: A minimum drop of -3 in the SMI over previous 3 weeks and a current SMI 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.

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.

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