

AG Blog Update 04 May 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 be 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.

This blog post was partially supported by NASA grant 80NSSC19K1266.

Order of Maps and Tables in today's Ag Blog

- Figure 1. CONUS Soil Moisture Index map
- Figure 2. Driest Grid Points
- Figure 3. U.S. Drought Monitor
- Figure 4. Quick Drought Response Index map
- Figure 5. South America Soil Moisture Index map
- Figure 6. Western Russia/Ukraine Soil Moisture Index map

Narrative:

Most of the country has been drier than average in recent weeks and in some cases drier than average weather has been the rule for over a year. As of last Thursday, over a third of the domain had an SMI under -3.0 (Figs 1-2). The percentage of grid points with an SMI at or below 0.0 is closing in on 80 percent. While it is premature to sound the panic alarm on a major drought encompassing the majority of the Corn Belt, the next 4-6 weeks will be critical for precipitation for the major corn/soybean/spring wheat producing regions that are short on soil moisture currently. In the case of North Dakota, the drought is extreme and likely headed to exceptional status (Fig. 3). Precipitation is needed soon to have any realistic shot at a reasonable spring wheat crop in that area. North central Iowa and into southern Minnesota weren't classified as drought on the latest Drought Monitor (as of last Thursday) but that may change soon as this area

missed the bulk of the significant precipitation today (again). Figure 4 shows that QuickDRI is also indicating drier conditions and possibility of imminent vegetation stress.

Even though this area is not technically in drought, topsoil moisture is quite short and could have a detrimental impact on emergence. As is the case further east in the Corn Belt, if the next month to 6 weeks are below average, conditions are going to be ripe not just for worsening drought conditions there but possibly across a good portion of the region. A quick look at output from recent ECMWF runs shows good rain chances for much of the region, though not so much in northern Iowa and southern Minnesota where rain is needed.

Two months ago my corn outlook favored above trend corn but with a non-significant chance (~1 in 3) of well-below trend corn from a major drought. It's still too early to call for such an event but suffice to say that risk is non-zero and will start going up rapidly if May is as dry as April. The official [precipitation forecast](#) from the CPC for May is for above average precipitation so if that comes to fruition, the risk of a major 1988 or 2012 style drought will be much less.

Elsewhere in the U.S., the southeast was still quite dry though today has been helpful from a rainfall perspective, less so from severe weather. Much of the western U.S. remains a tinderbox, though conditions are starting to improve a bit along the Front Range.

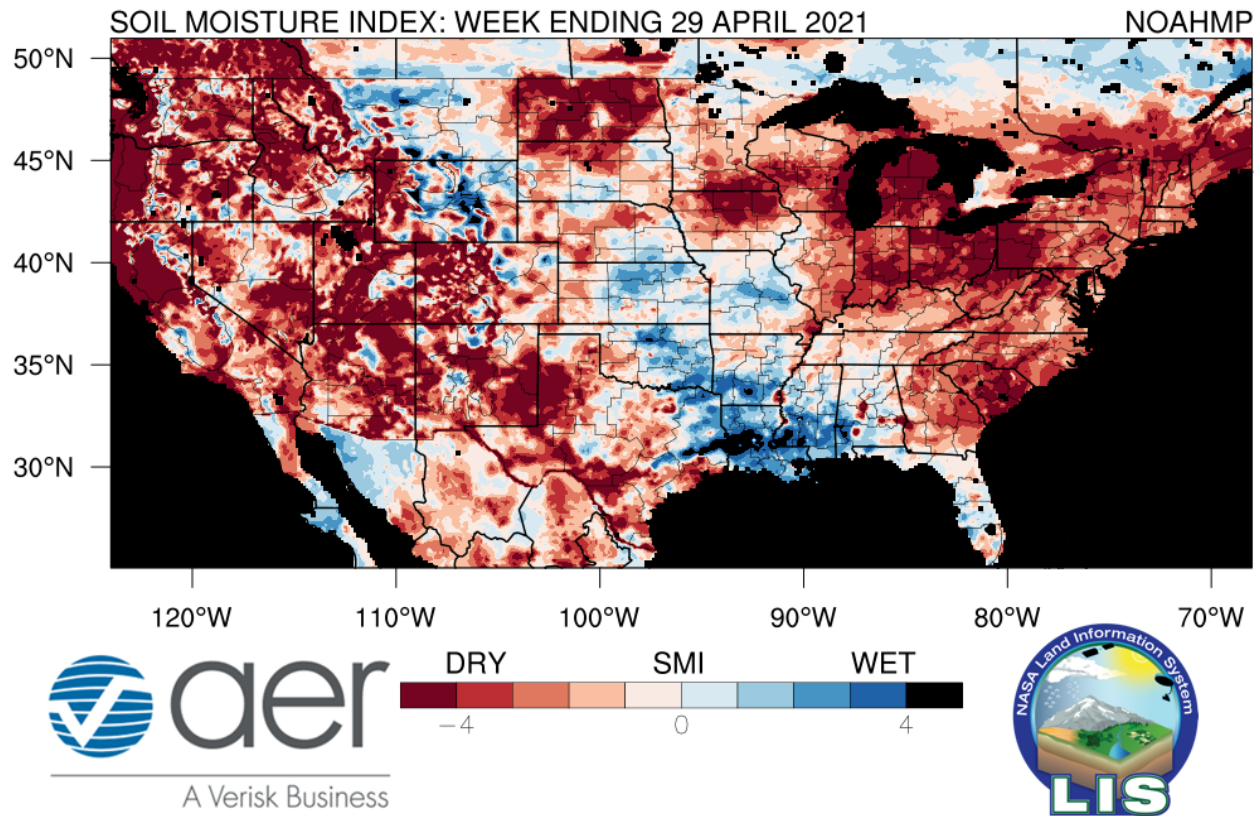


Figure 1. The Soil Moisture Index (SMI) for the 7-day period ending 29 April 2021. Results are based on output from the 0-1 m (surface to 3.23 feet) layers in the Noah-Multiparameterization ([Noah-MP](#)) land surface model. Noah-MP is run in the NASA Land Information System ([LIS](#)) framework with 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.

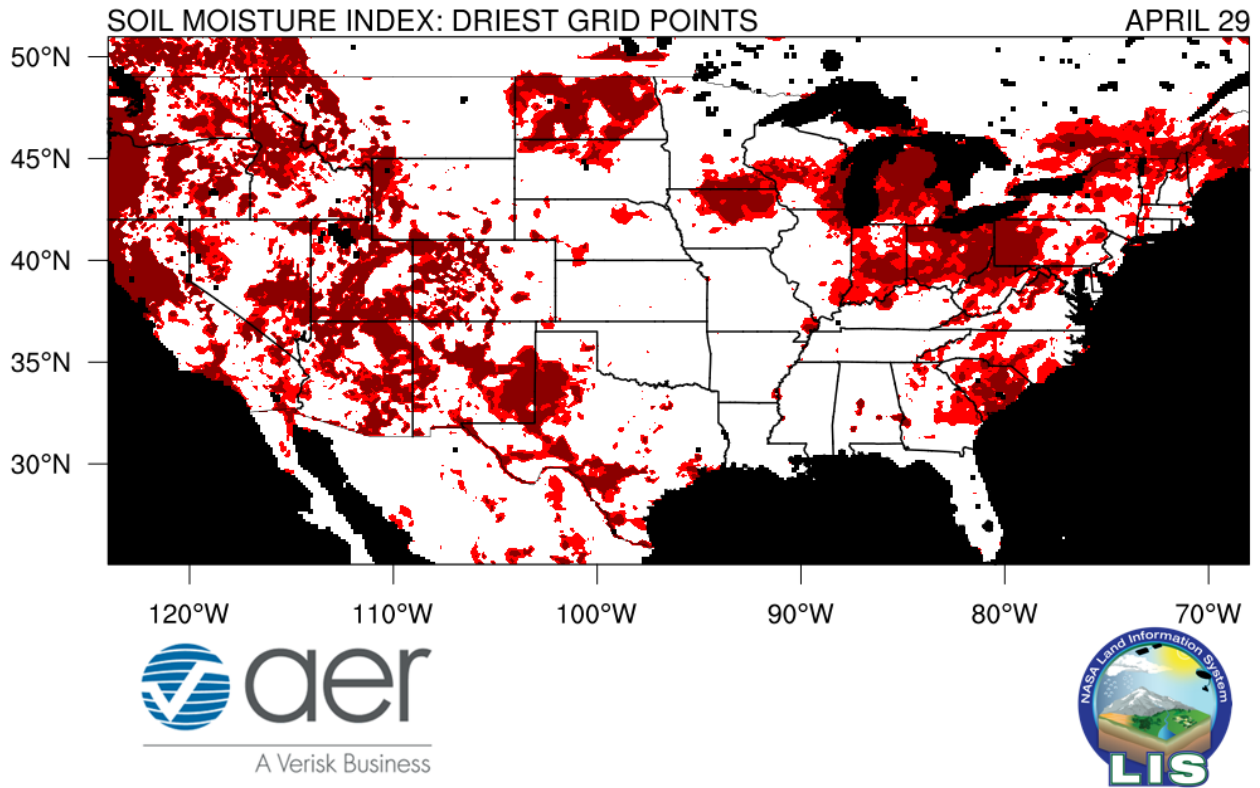


Figure 2. Lowest 20th (10th) percentile of soil moisture as depicted by red (dark red) pixels for the week ending 29 April 2021.

U.S. Drought Monitor

April 27, 2021
 (Released Thursday, Apr. 29, 2021)
 Valid 8 a.m. EDT

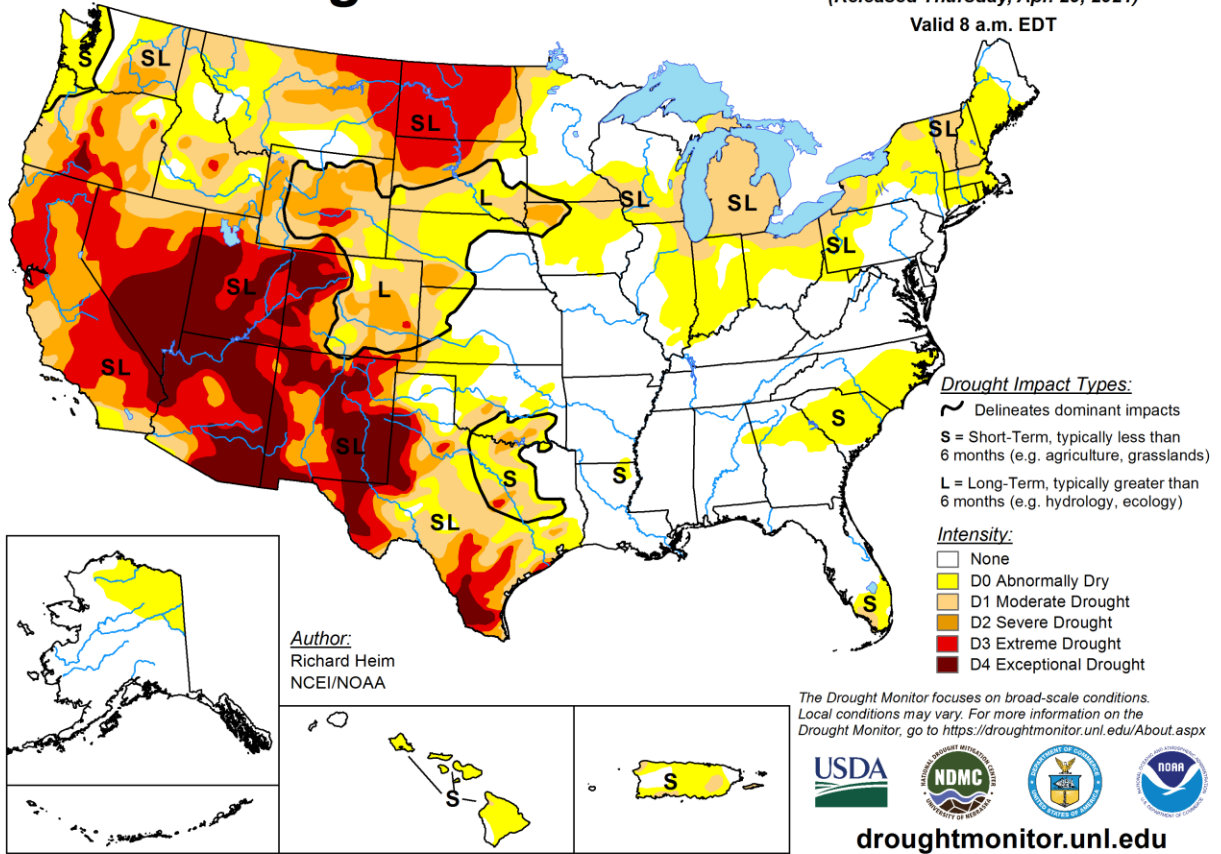


Figure 3. U.S. Drought Monitor map as of 27 April 2021. Map courtesy of the National Drought Mitigation Center.

Quick Drought Response Index (QuickDRI)

May 2, 2021 (Week 18)

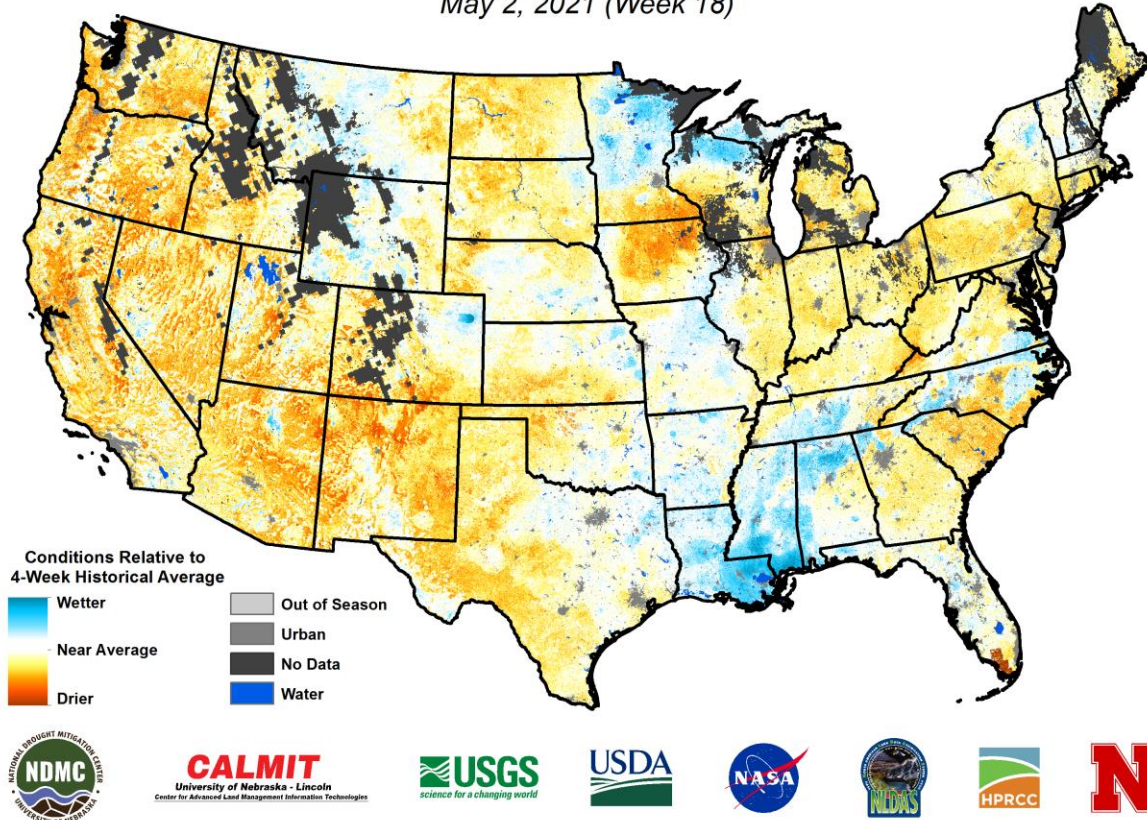


Figure 4. Most recent Quick Drought Response Index (QuickDRI) map courtesy of the University of Nebraska-Lincoln. Additional information can be found [here](#).

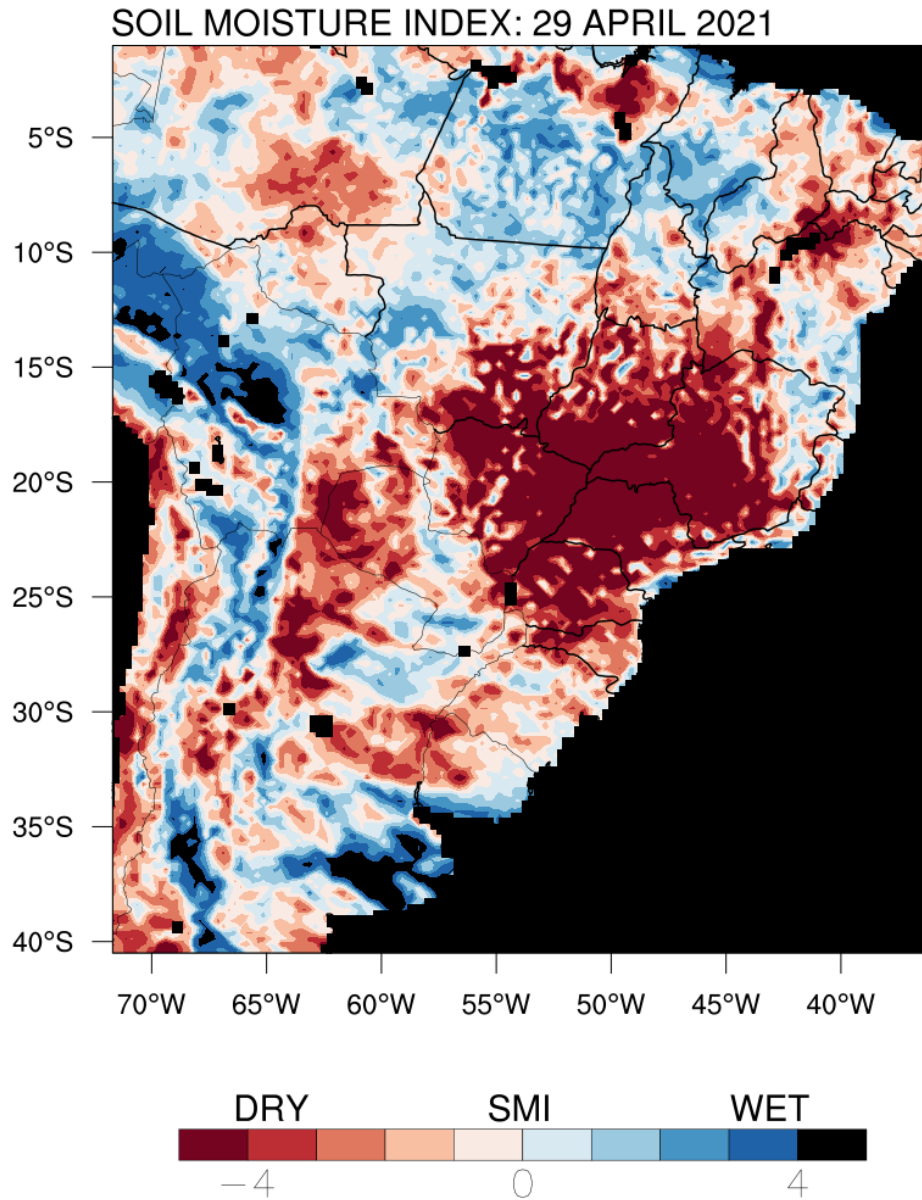


Figure 5. Soil moisture index (SMI) map) for the 7-day period ending 29 April 2021 over South America. Refer to the caption in Figure 1 for more details.

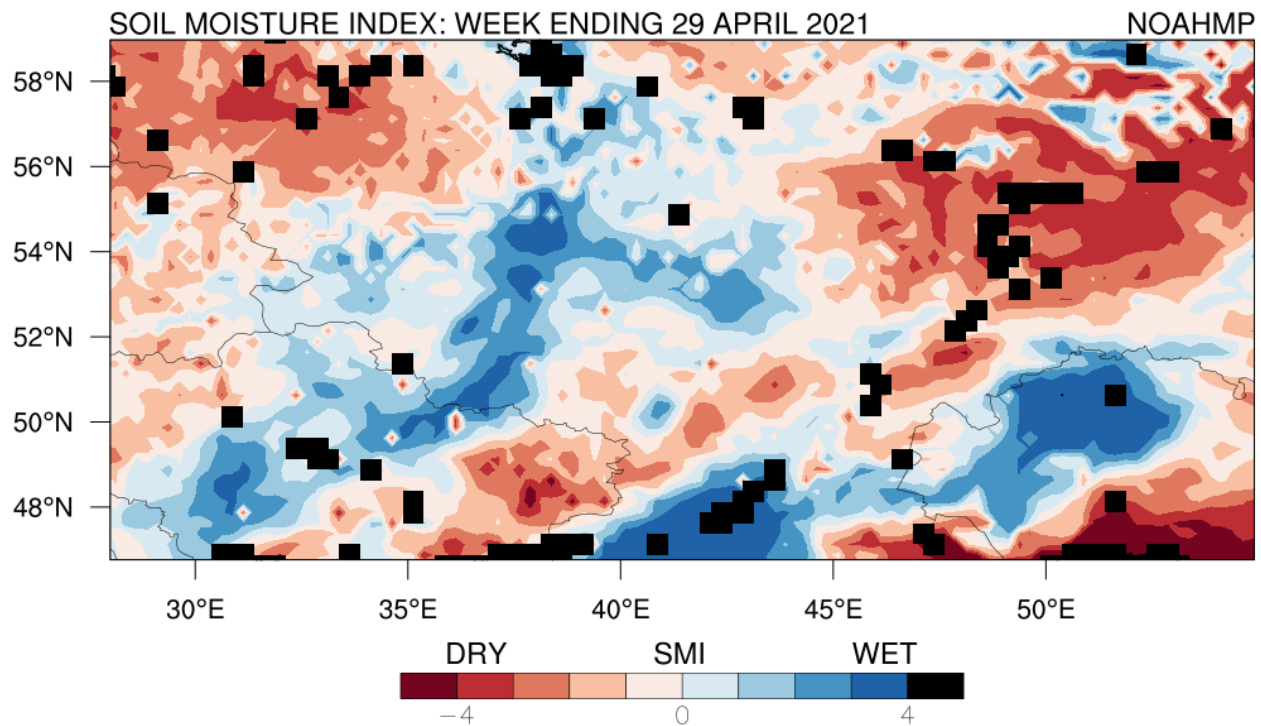


Figure 6. Soil moisture index (SMI) map) for the 7-day period ending 29 April 2021 over western Russia, Ukraine, and northwestern Kazakhstan. Refer to the caption in Figure 1 for more details. Black squares are missing data points.

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:

Founded in 1977, Atmospheric and Environmental Research is an award-winning environmental research, consulting and weather information services company with demonstrated expertise in numerical weather prediction, climate dynamics and radiation, circulation diagnostics, atmospheric chemistry, air quality and risk assessment, planetary sciences, remote sensing, satellite meteorology, and systems engineering. Consulting services are available. AER is a business unit of Verisk Analytics (VRSK). For more information, please visit our web site at www.aer.com.

Disclaimer: *This report and the information and data contained herein (the Report) are wholly advisory in nature and are provided AS IS. AER makes no representations, covenants or warranties of any kind, either express or implied, with respect to the Report, including, without limitation, warranties of condition, quality, durability, suitability, merchantability or fitness for a particular purpose, or in respect of any warranty arising by statute or otherwise in law or from a course of dealing or usage of trade. The information included in the Report may be statistical samples and/or actuarial calculations and AER makes no warranties or representations, either express or implied, that the Report will accurately reflect, predict or resemble experience for an entire industry or any member or members of any industry. AER shall have no liability and shall not be responsible for business and legal conclusions, judgments and decisions made with respect to the Report. AER does not warrant and makes no representations regarding the completeness, currency, accuracy or predictive value of the Report. AER makes no representations and assumes no responsibility for the accuracy of the Report and is not responsible for errors resulting from omitted, misstated or erroneous information or assumptions.*