United States Department of Agriculture

Foreign Agricultural Service
Global Market Analysis
International Production Assessment Division
Web: https://ipad.fas.usda.gov

January 18, 2022

Commodity Intelligence Report

Russia's 2021 Ice Crusting Event Caused Production Drop for Winter Wheat

Russia experienced an infrequent event known as "ice crusting" during February and March of 2021. Ice crusting occurs by the thawing and refreezing of water in the snowpack or in the top layer of the soil. This type of melting and refreezing usually occurs when the temperature fluctuates between below- and above-freezing temperatures over a relatively short period of time. Ice crusting, if present for a few weeks, can smother the crop and cause large levels of loss. Ice crusting caused high levels of winterkill for Russian wheat in market year (MY) 2021/22, in addition to normal winterkill.

Russia's MY 2021/22 wheat production is estimated at 75.5 million metric tons (mmt), down 12 percent from last year. USDA crop production estimates for Russia exclude estimated output from Crimea. USDA follows guidance for Crimea as set by the State Department of the United States. The Russian estimates are divided into two crop seasons, winter and spring, which can be found here on USDA's PSD Online. Select "Downloadable Data Sets" and open the zipped file for "Russia Wheat; Winter/Spring Area & Production". Spring wheat production is estimated at 23.0 mmt and winter wheat is estimated at 52.5 mmt. Total yield is estimated at 2.74 tons per hectare (t/ha), down 8 percent from last year. Winter wheat yield is estimated at 3.50 t/ha, down 7 percent from last year. Spring wheat yield is estimated at 1.83 t/ha, down 3 percent from last year. Total area is estimated at 27.6 million hectares (mha), down 4 percent from last year. Winter wheat area is estimated at 15.0 mha, down 10 percent from last year. Spring wheat area is estimated at 12.6 mha, up 5 percent from last year.

Russia experiences some level of normal winterkill every year. Winterkill is calculated using autumn planted area statistics from the Russian statistics agency, Rosstat, minus the planted area that survived winter. The difference between the two numbers is winterkill. Winterkill in Russia over the last twenty years has been variable, but for the last few years (excluding the 2019/20 winter) winterkill has been below a 4 percent loss (See Figure 1). Using information from the Russian Ministry of Agriculture for MY 2021/22, planted area for all winter crops in the fall of 2020 was stated at 19.3 million hectares, which was almost a million hectares larger than the previous year's planted record (all based on Ministry of Agriculture data) (See Figure 2). Winter wheat usually accounts for about 90 percent of the Ministry of Agriculture's winter crops.

The Russian statistical agency, Rosstat, publishes a report every year on crop-specific planted area that survives winter. Due to the ice crusting that occurred during February and March, winter wheat planted area dropped in the Central District, which resulted in higher spring wheat planted area, both of which are shown in Figures 3 and 4.

Ice crusting is difficult to detect using regular optical remote sensing imagery because the ice crusting typically occurs on top of snow cover, or in the layer between the soil profile and the snow cover. Satellites with optical imagery sensors detect energy frequencies in the visible-to-medium infrared spectrum whereas microwave sensors operate in a much lower frequency range. Using data from the microwave Soil Moisture Active Passive (SMAP) system, however, shows the routine soil moisture and the freeze/thaw observations (See Figures 5, 6, and 7). This information combined with other observations such as temperature data and snow cover anomaly data can indicate the existence of ice crusting. Whenever there are fluctuations in temperature between below-freezing to above-freezing to below-freezing with the presence of snow cover, this can indicate ice crusting because of the freeze/thaw/freeze (See Figure 8, 9, and 10). Combining the temperature data with additional information about the quantity of snow cover (instead of just presence/absence of snow), such as the snow cover anomaly product from the Special Sensor Microwave/Imager (SSMI), can also indicate the occurrence of ice crusting (See Figure 11). The warmer temperatures throughout late February into early March caused melting in the top layer of the soil profile, which had been frozen during February. The meltwater then refroze in the second week of March, which led to damage for the winter crops. Finally, the Russian Hydrometeorological Center publishes data on the area of crops in poor conditions over winter by regional percentage (See Figure 12), which is another indicator of high levels of winterkill.

Ice crusting that causes major production disruptions is a rare event. Prior to this recent event, the last major instance of ice crusting for Russia occurred in 2006 (Report Link). Previous ice crusting (or other reports published by USDA's International Production Assessment Division) can be searched via the USDA-IPAD Voyager Search engine found here.

The contributions from Iliana Mladenova are gratefully acknowledged.

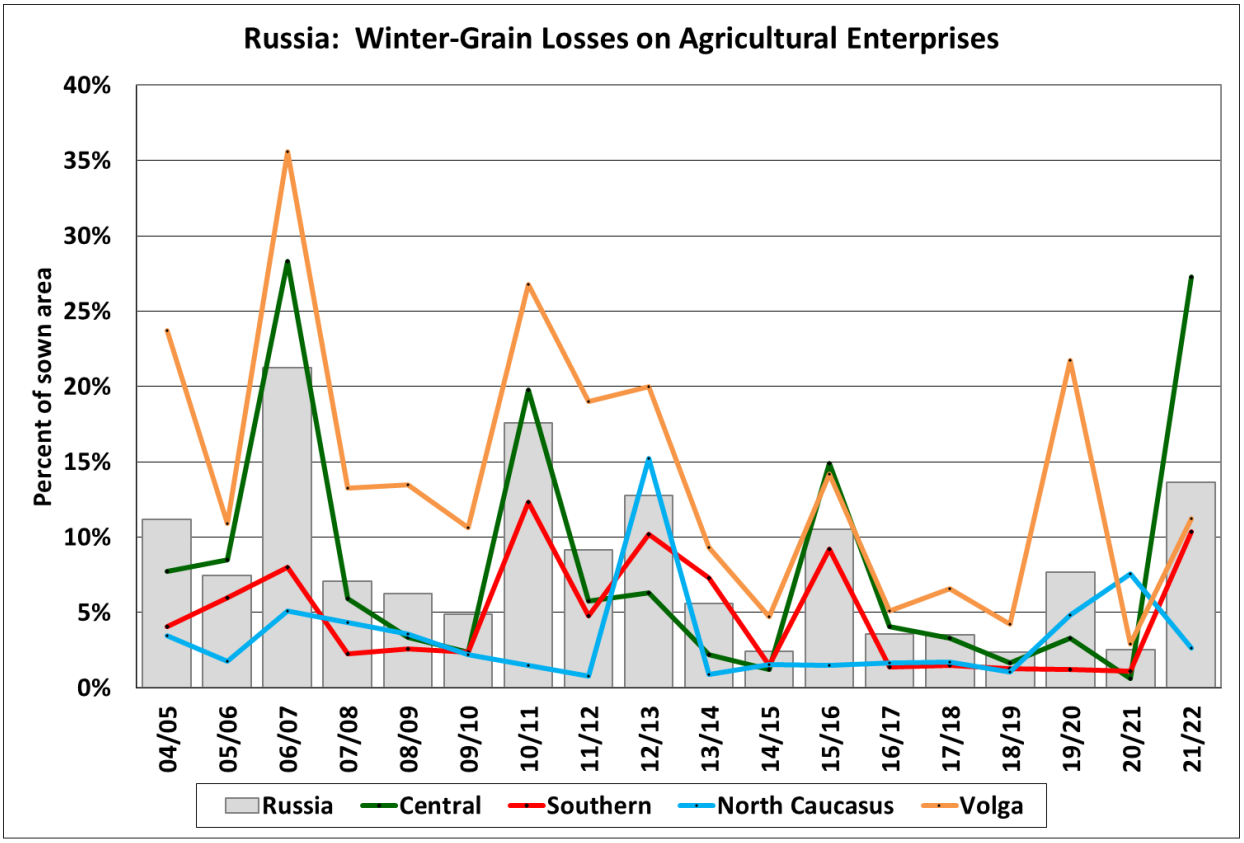


Figure 1. Russia winter grain losses on agricultural enterprises

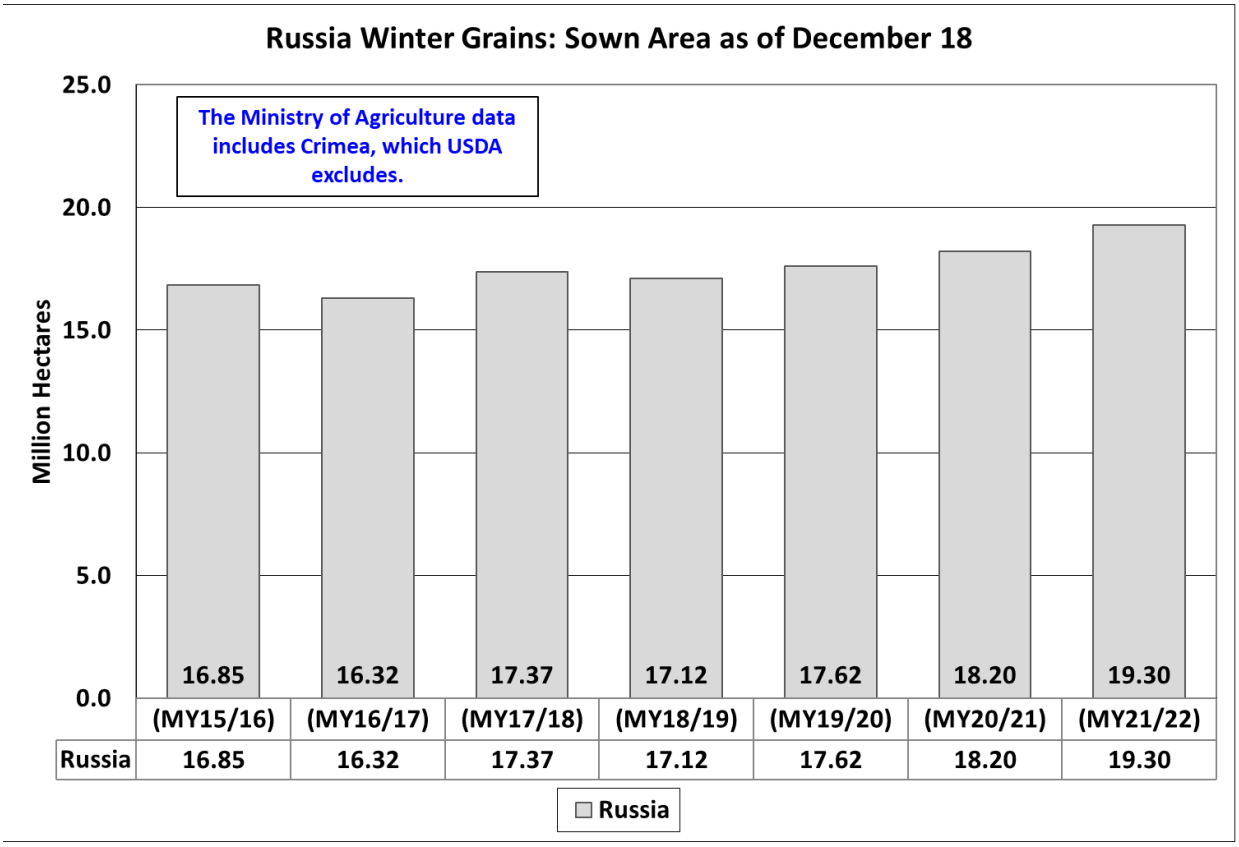


Figure 2. Russia Winter Grains Sown Area from the Russian Ministry of Agriculture

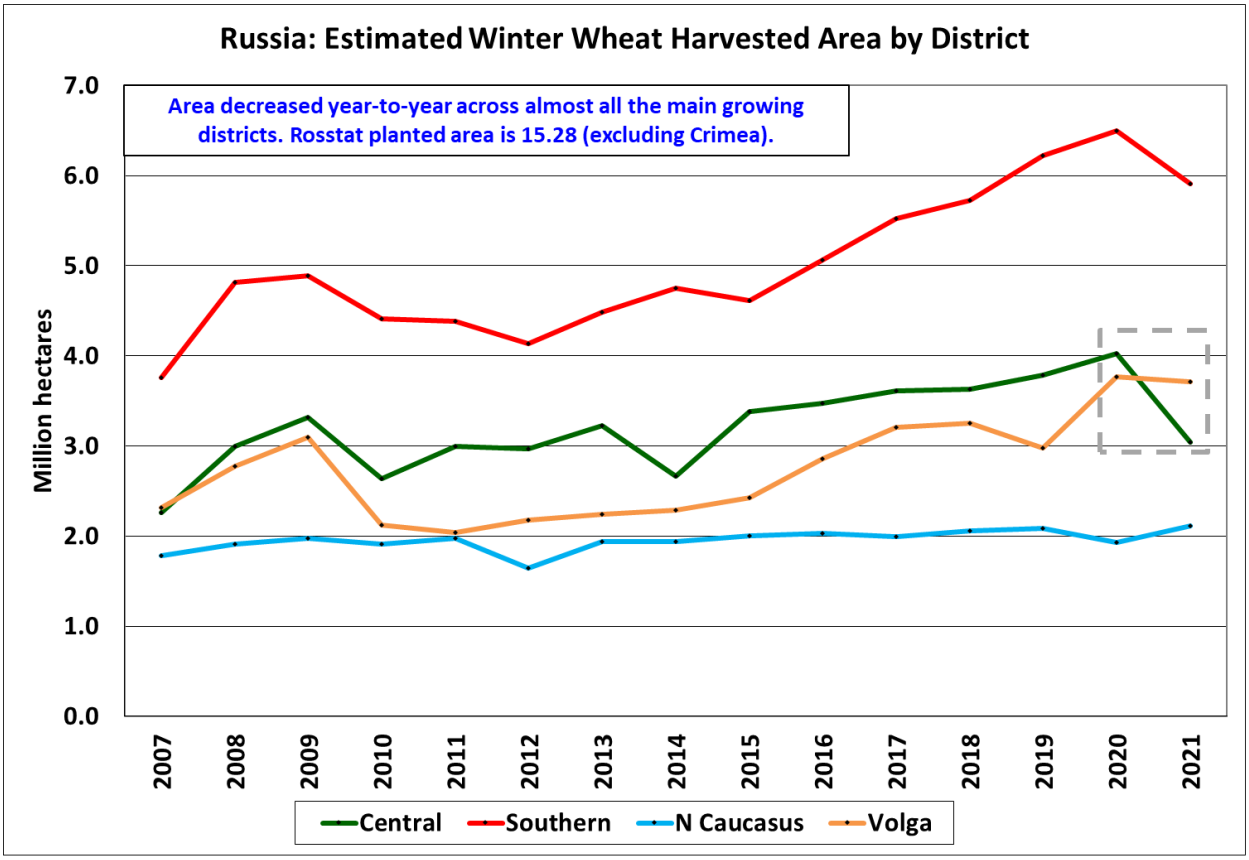


Figure 3. Russia Winter Wheat Harvested Area by District

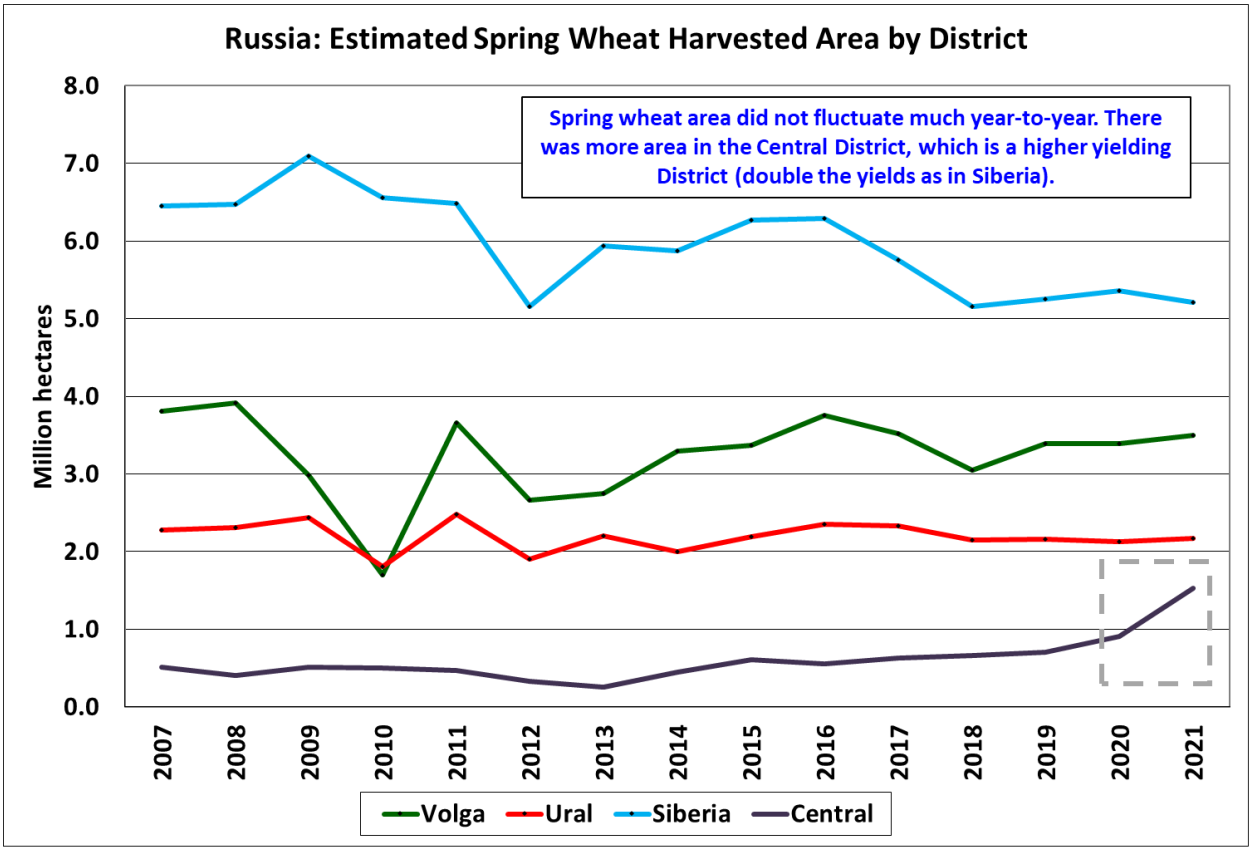
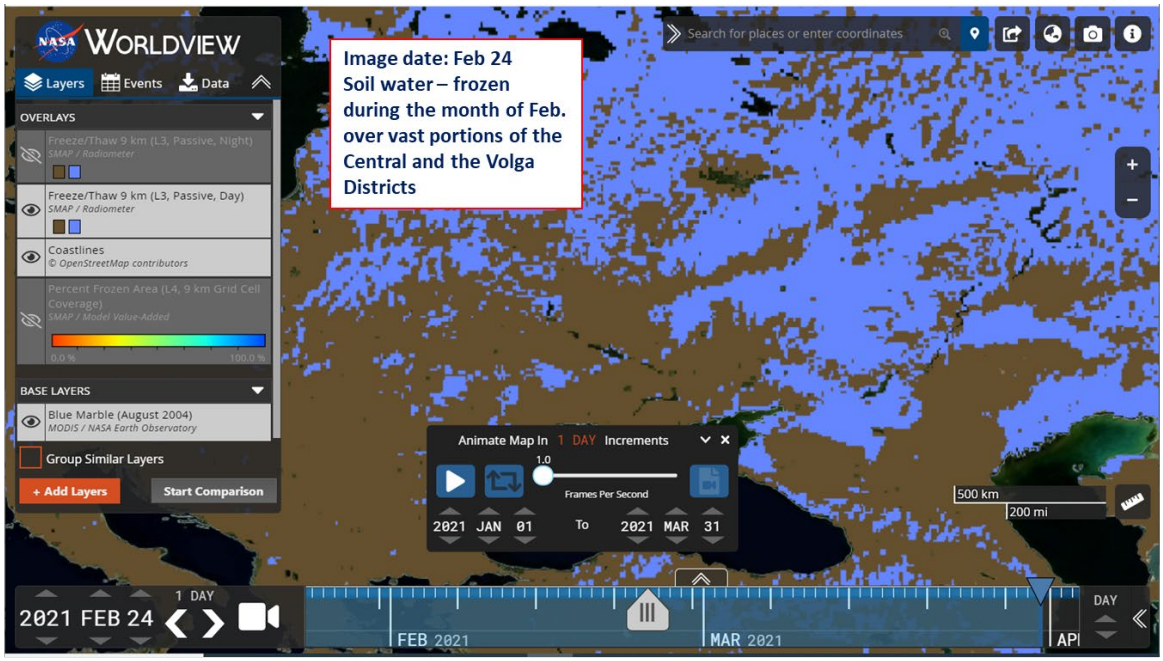


Figure 4. Russia Spring Wheat Harvested Area by District



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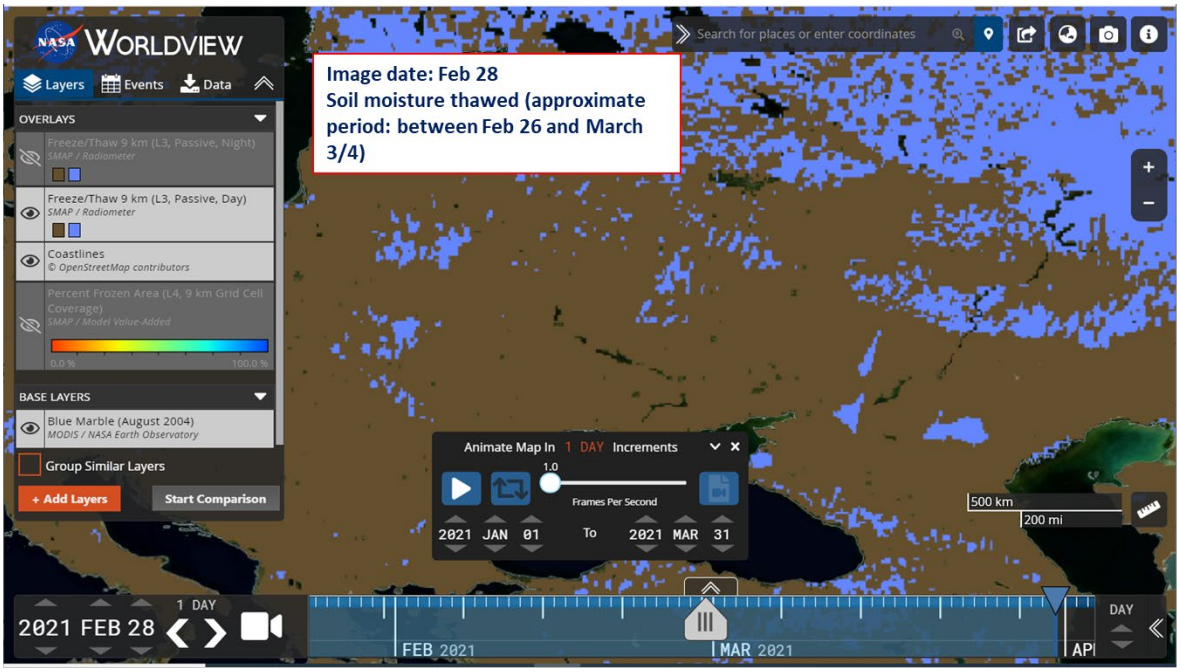
Source: NASA Soil Moisture Active Passive system

Figure 5. Soil Moisture Active Passive system showing frozen soil



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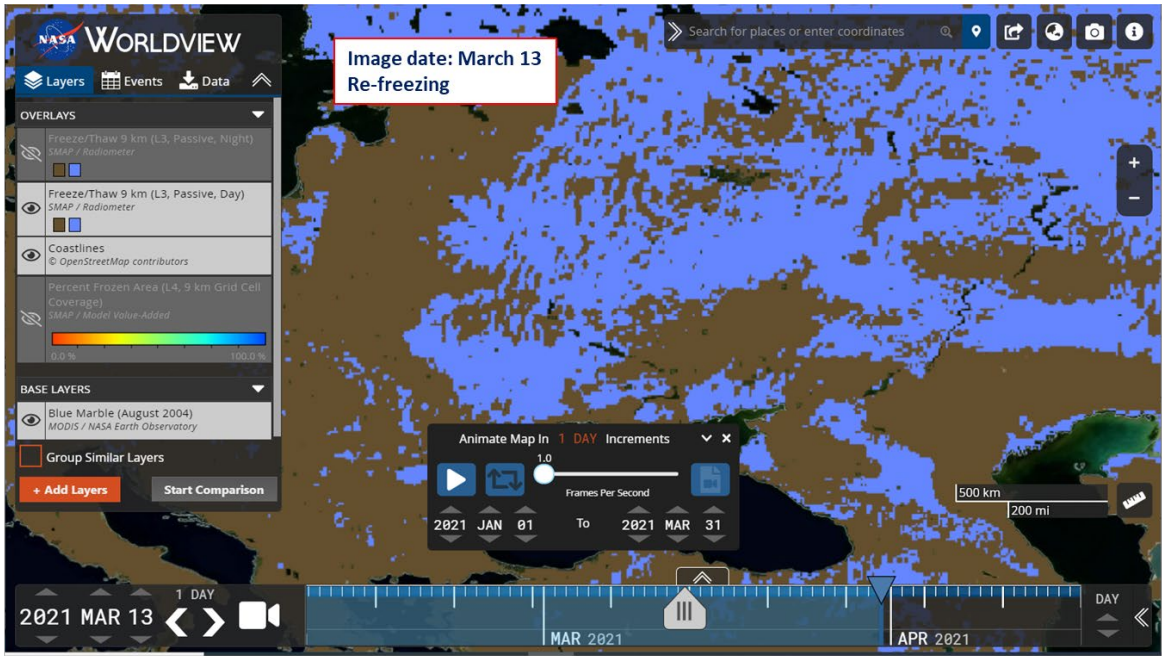
Source: NASA Soil Moisture Active Passive system

Figure 6. Soil Moisture Active Passive system showing thawed soil



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Source: NASA Soil Moisture Active Passive system

Figure 7. Soil Moisture Active Passive system showing frozen soil

Below freezing temps with snow

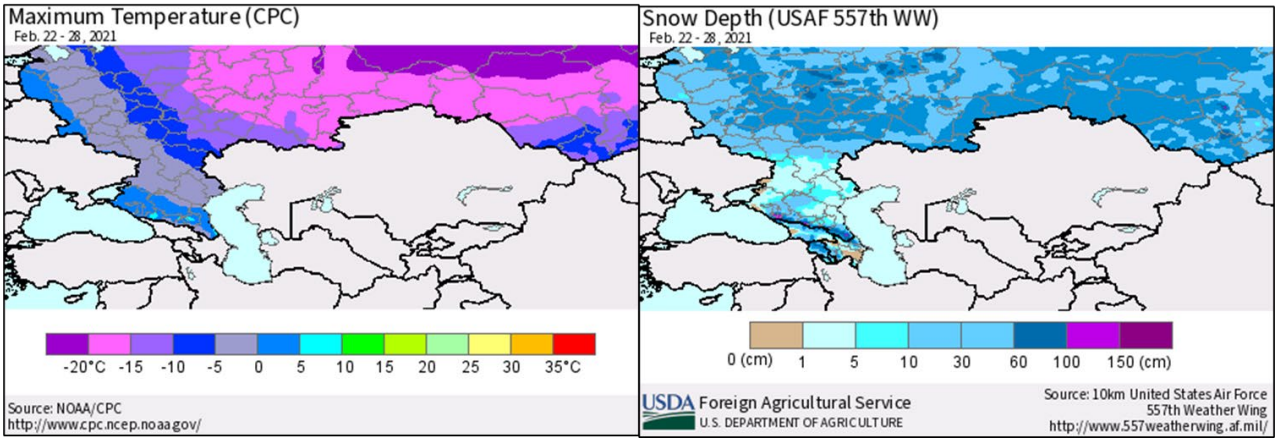

Figure 8. Below freezing temperatures in Russia but the region is covered in snow (freezing)

Above freezing temps with snow

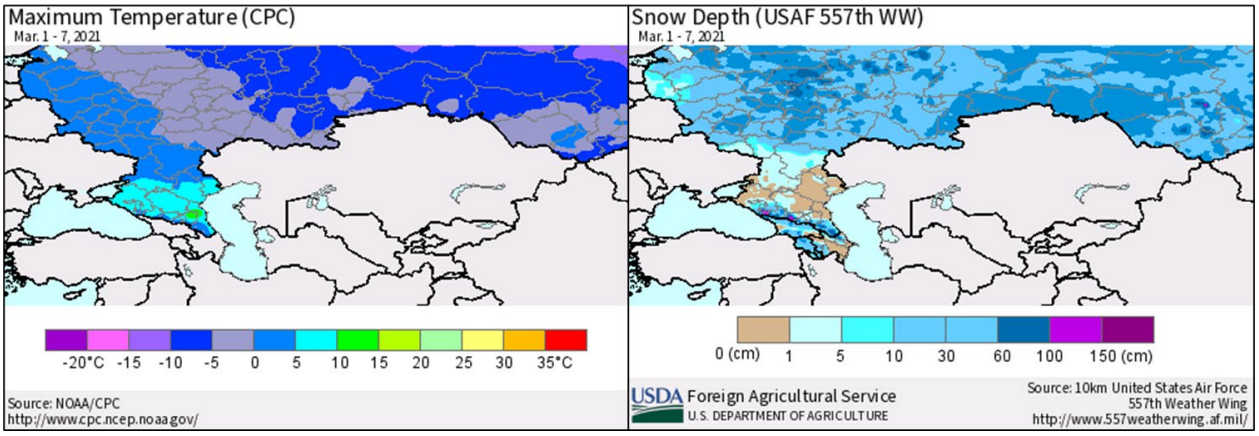

Figure 9. Above freezing temperatures in Russia and the region remains covered in snow (thawing)

Below freezing temps with snow

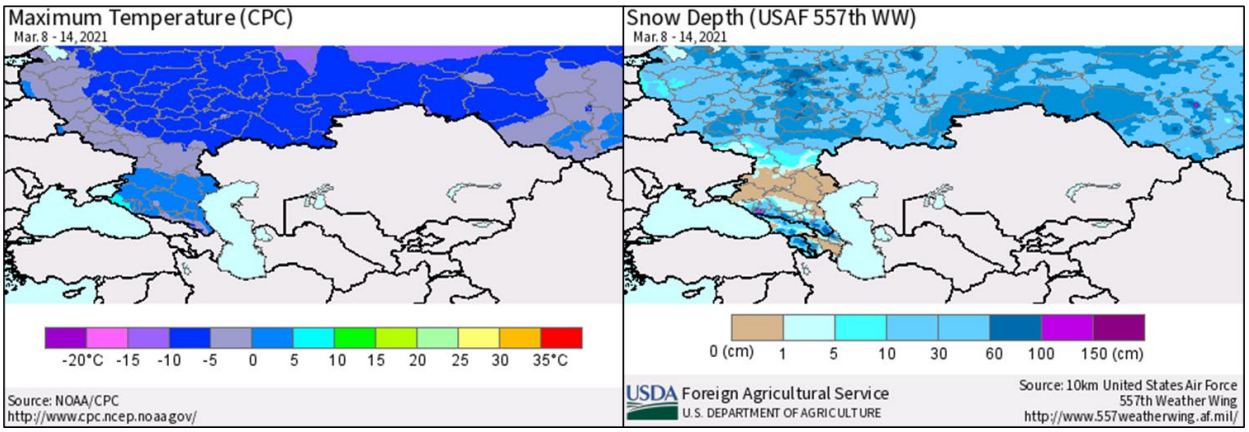

Figure 10. Below freezing temperatures in Russia and the region remains covered in snow (freezing)

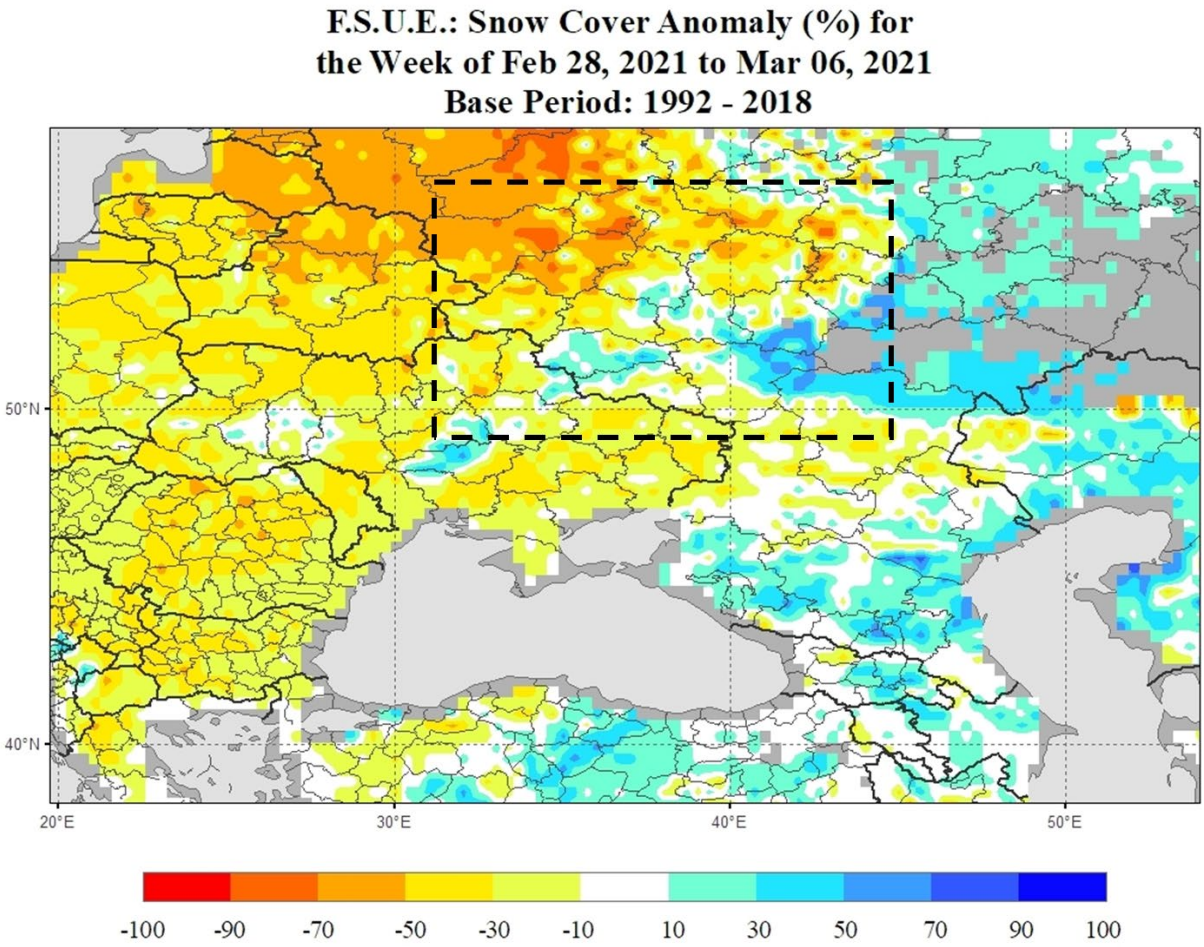

Figure 11. Snow Cover Anomaly product shows below average quantity of snowcover throughout the Central District of Russia

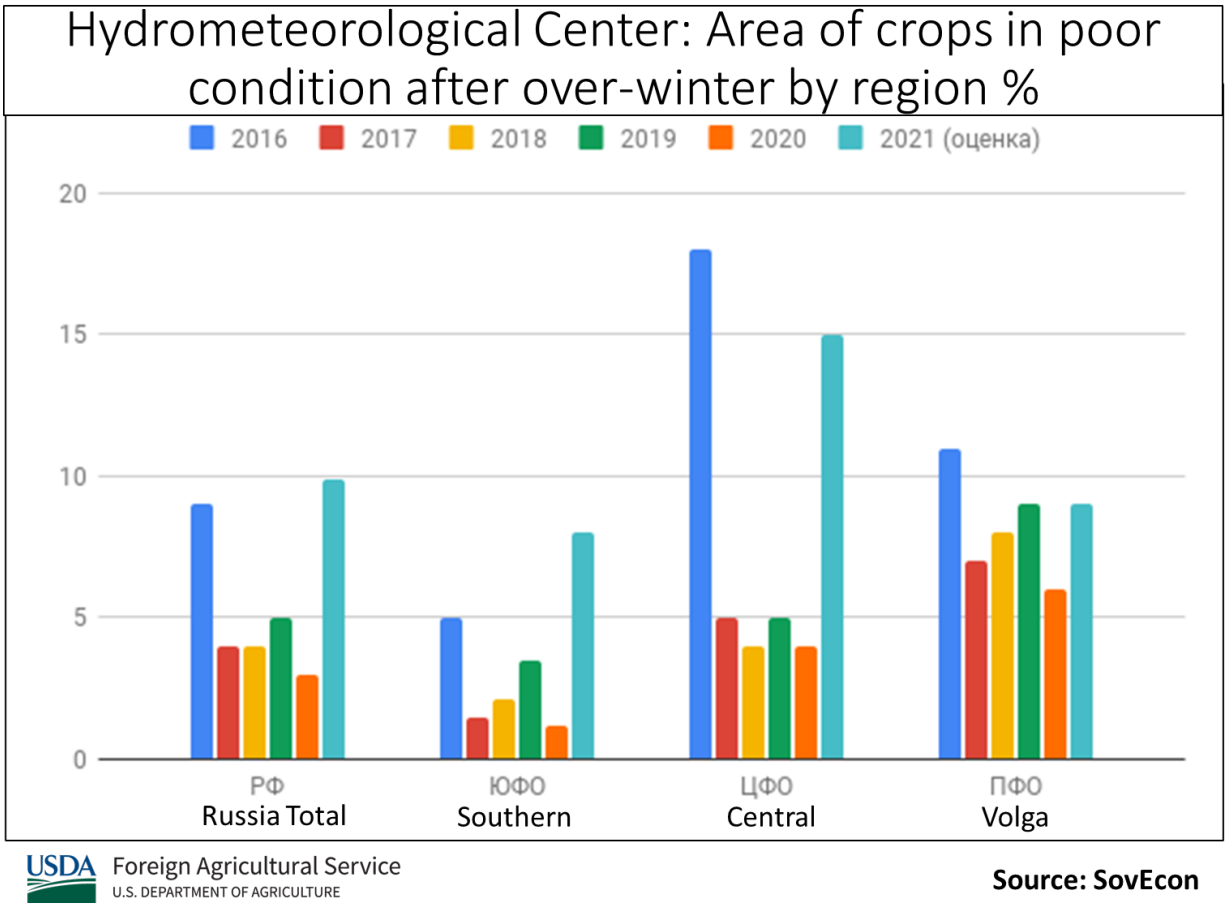

Figure 12. Russian Hydrometerological Center's data on percent of area in poor condition after winter

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Global Agricultural Information Network (Agricultural Attaché Reports)
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Crop Explorer
https://ipad.fas.usda.gov/cropexplorer/

Global Agricultural and Disaster Assessment System (GADAS)
https://geo.fas.usda.gov/GADAS/index.html