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The Canadian Agriculture Weather Prognosticator

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World Weather At A Glance

- Argentina's drought remains serious with early corn and sunseed already damaged beyond repair, but second season corn, sorghum, soybean and cotton could still perform well if normal weather evolves soon.
- U.S. hard red winter wheat areas are still quite dry outside of Oklahoma, but no relief is expected over the next few weeks.
- Australia weather has improved greatly after too much rain in October
- Brazil summer crops are poised to yield very well.
- India's winter crops are being planting and establishing relatively well.
- China's wheat crop is favorably established and rapeseed conditions have improved greatly.
- Europe, including Ukraine, may be colder than usual in December with stormy weather in the south.

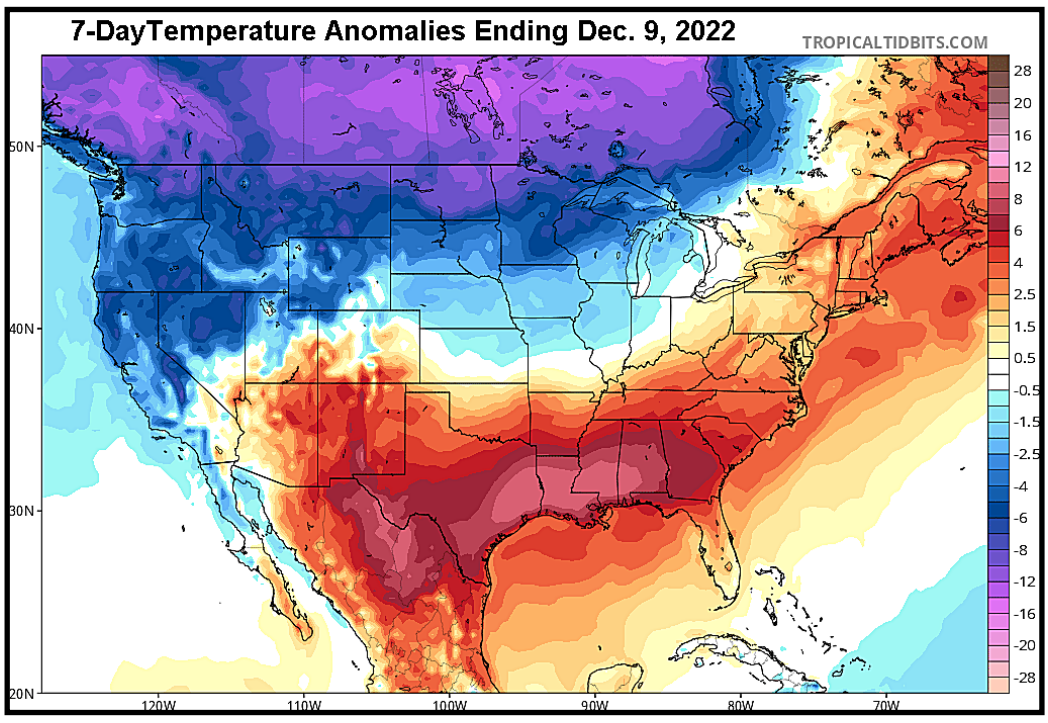
December Gets Off To A Cold Start

La Nina may be on its last cycle of influence for the world, but it is certainly bringing down the temperatures in many areas around the world. Bitter cold is not only present in Canada's Prairies, but in much of Asia and it is expected to expand into northern Europe over this coming week.

La Nina is not acting alone—at least not any more. The negative phases of Arctic and North Atlantic Oscillation are kicking in to perpetuate an already colder than usual bias. World Weather, Inc. believes the trend for cold weather in western Canada will only last into January and then there should be a shift of the coldest air to the east during the second half of the winter.

The negative phases of Arctic Oscillation and North Atlantic Oscillation usually bring temperatures down below normal across at least a portion of North America and that has certainly been the case recently. Actually the cold that begin in late November was primarily a La Nina driven phenomenon, but now that higher than usual pressure is building up across the Arctic the cold will be perpetuated for a while. High pressure over the Arctic produces sinking motion from higher up in the atmosphere. That sinking motion brings colder air down into the lower atmosphere and as the heavier cold air reaches the surface of the earth it spreads out to lower latitudes while additional cold air sinks from higher altitudes.

Negative Arctic Oscillation tends to push the cold air through the central and eastern Prairies and



December Gets Off To A Cold Start (continued from page 1)

into the U.S. Plains and western Midwest. The negative North Atlantic Oscillation tends to support more cold air from central Canada into the eastern U.S. All of this occurs while La Nina is playing out which favors a cold bias in western Canada, the far western United States and the north-central states. Having all three phenomena occurring at the same time can sometimes lead to a broad based colder than usual bias for much of North America and that certainly looks to be the case in the first half of this month.

World Weather, Inc. expects La Nina to weaken in the second half of winter, but the negative phases of Arctic Oscillation and North Atlantic Oscillation may continue at times perpetuating some of the cold, but shifting it out of western North America and more into the east. That suggests negative North Atlantic Oscillation will dominate the second half of the season raising energy demand while helping to induce greater snowfall in some areas of the continent.

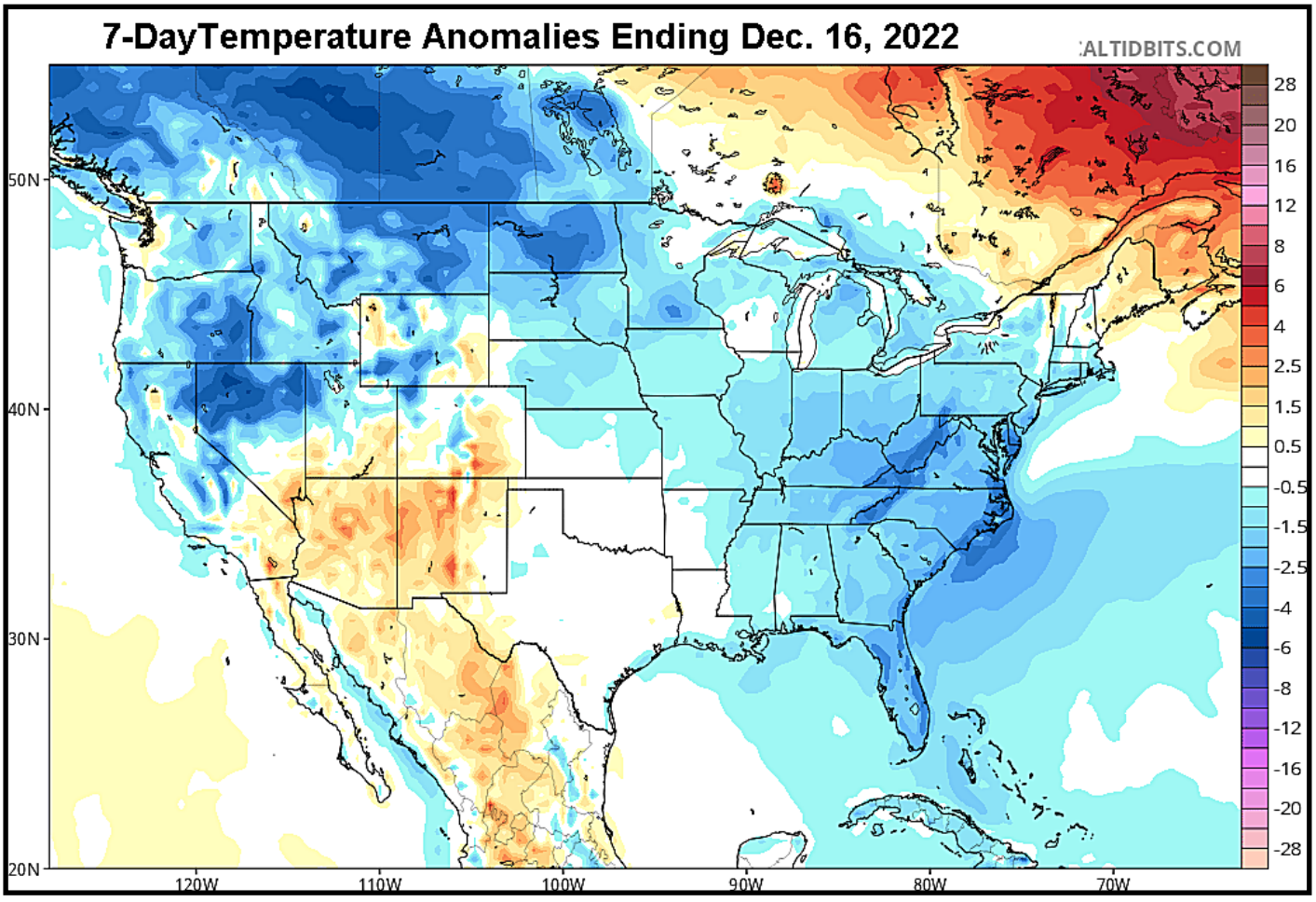
The precipitation bias during these combined cold surges is normally light. Moisture totals in the first half of this month will likely be near to below normal. It will be colder than usual and that should allow snow to fall in many areas even though its moisture content will be lighter than usual.

No major storm systems are expected but in cold years like this one there is a tendency for frequent bouts of very light snow to fall, but rarely are the Prairies subjected to unusually great amounts of snow.

There is potential for a wetter finish to the winter season this year especially if the cold air shifts to eastern North America. In that particular case warm air would flow into western parts of the continent and the overrunning of warm air into the cold air that will be lingering in some areas for a while should result in greater precipitation.

February and March may be snowier than usual from southwestern into central portions of the Prairies because of alternating periods of warm and cool weather. Precipitation will occur frequently and it will be sufficient enough to put more snow on the ground than that of the more recent past years.

Melting snow in the spring should translate into greater levels of topsoil moisture that might lead to some delay to early planting in 2023. For the most part, the wetter biases will be welcome and good for future crop development.



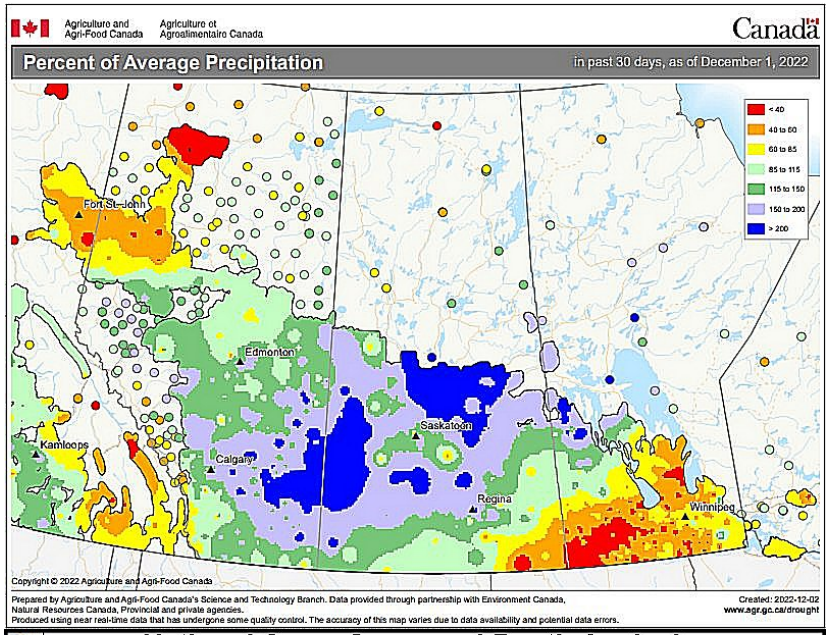
Prairies Drought Relief in November Not Enough

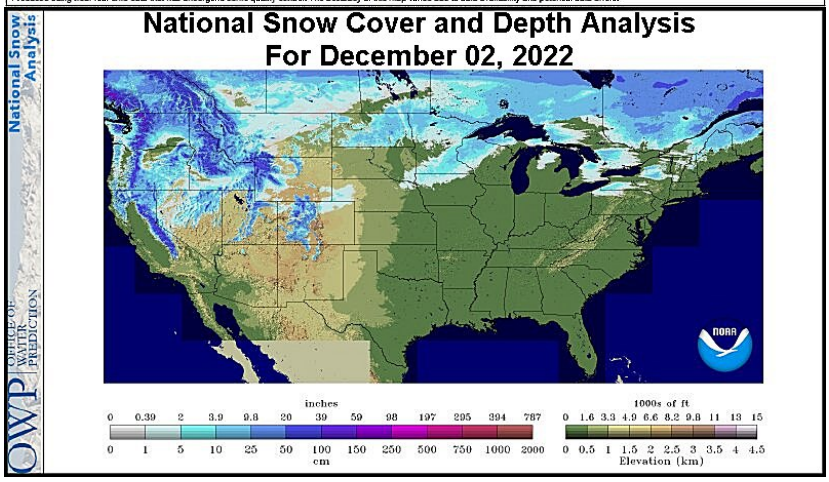
A large portion of Alberta and Saskatchewan received near to above normal precipitation in November, though moisture deficits persist in some of the main production areas. Current snow depths are light in many areas, but there has been some significant snowfall in several areas. Snow water equivalents in the areas of low snow depth are too low to significantly impact long-term soil conditions when melting occurs in the spring.

Temperatures during the past month were colder than normal as well for Saskatchewan and much of Alberta. Periods of light precipitation are expected during the next two weeks that will marginally bolster snowpack. Resulting precipitation will be too light to significantly impact long-term soil conditions once it melts next spring. Two waves of arctic air will also spread across the region through the middle of next week before more moderate temperatures are expected toward mid-December.

Precipitation varied across the Canadian Prairies in November. Portions of southern and east-central Alberta through much of Saskatchewan outside the southeast corner into northwestern Manitoba generally received near to above normal precipitation. These locations received 85% to over 200% of normal precipitation for the 30-day period ending December 1. Southern Manitoba, the Interlake region, and southeastern Saskatchewan, along with much of Peace River country received below or well below normal precipitation. The remaining production areas in the Prairies received near normal precipitation.

Central and southern Alberta into a large section of Saskatchewan were also colder than normal in November. Many areas in southern Alberta and southwestern Saskatchewan saw temperatures trend nearly ten degrees Fahrenheit below normal . Manitoba and northern Alberta saw temperatures trend closer to normal.





Soil moisture remains short to critically short from much of central and southern Alberta into portions of western, southern, and central Saskatchewan. Some improvements were noted due to the above normal precipitation in November, though the cold weather firmed the ground, limiting the amount of moisture that made it to the soil. Other areas in Alberta have marginally adequate to short soil moisture as well. Manitoba and the remaining portions of Saskatchewan still have adequate soil moisture.

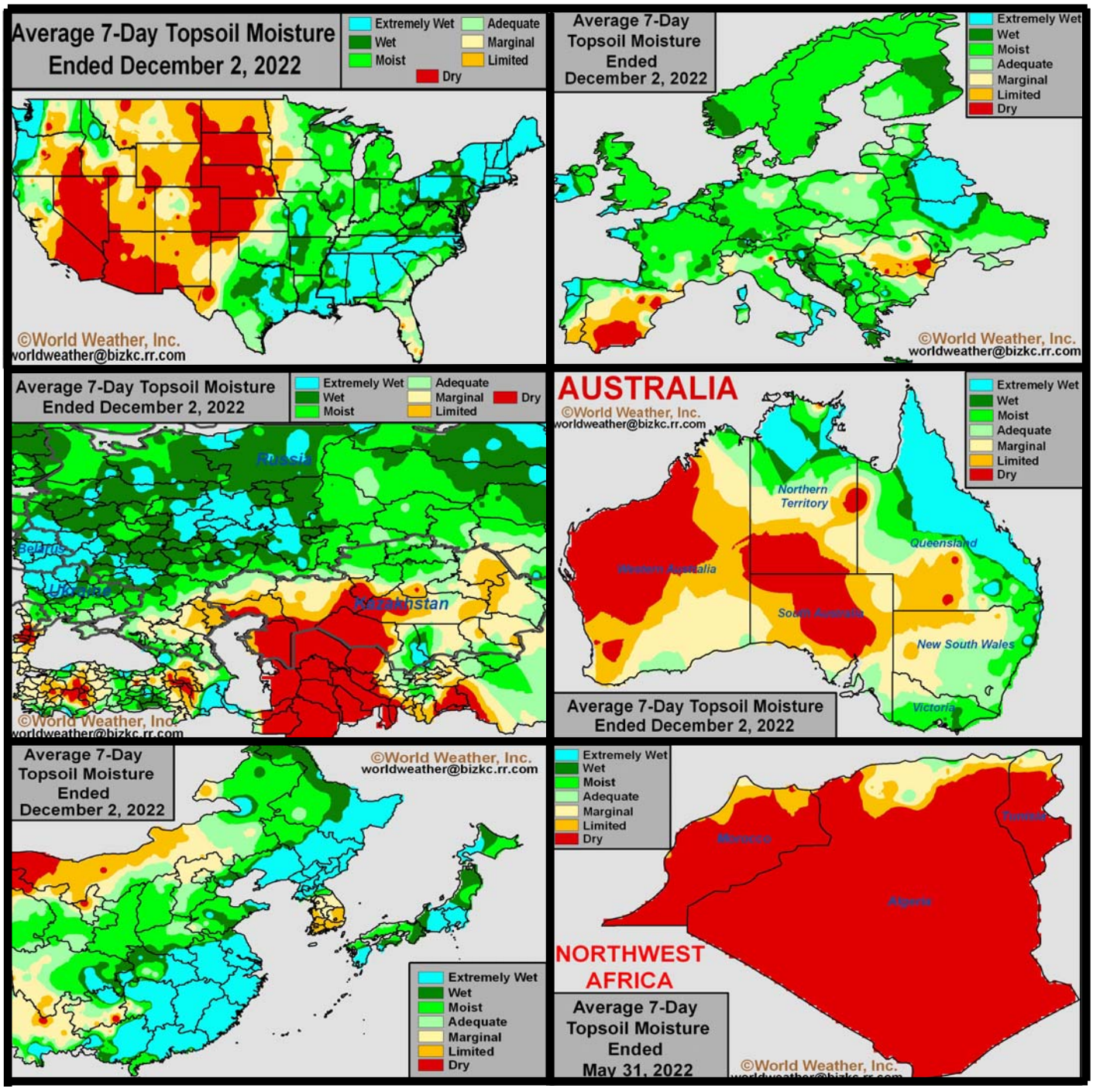
A band from southeastern Saskatchewan and southwestern Manitoba into southern sections of Manitoba's Interlake region are currently snow-free. Pockets in southern Alberta are also snow-free as of Friday morning. The remaining production areas have light to moderate amounts of snow on the ground, though snow depths are greater in northern sections of crop country.

The main concern over the winter will be the need for significant snowpack, most notably in the driest areas of Alberta and Saskatchewan. Several inches of moisture are needed to fix the moisture deficits. Moisture content in the snow that is on the ground is too low to improve long-term soil conditions. However, there is plenty of time to increase snowpack that will be beneficial next spring.

Unfortunately, some areas with thin snow cover are now being subjected to bitter cold conditions and that will lead to greater ground frost. Once frost gets into the soil only a very small amount of the spring snow melt will actually get into the ground

(Continued On Page 6)

Selected Weather Images From Around The World



North Africa soil moisture is not nearly what it should for the planting season. There have been periods of rain, but soil moisture has not been as abundant as usual and that may be limiting wheat and barley establishment. Australia's weather has improved greatly in recent weeks, but much damage was done to the early maturing wheat, barley and canola during October's deluge of rain. Harvest conditions in Australia recently and on into early December will be close to ideal with restricted rain protecting late season crops in the south. China's rapeseed region dealt with early season drought threatening emergence and establishment, but that has been fixed ahead of cooler air and crop establishment should slowly improve over time this winter. U.S. drought in its hard red winter wheat region remains serious, but changes are coming late this winter and early in the spring that may turn that crop around. Europe still has some dryness to deal with in Spain and the lower Danube River Basin where crops may not be well established.

Less Snow, Cold In December; Still Cool In January

December is obviously starting out bitterly cold. The coldest weather will be in the first half of this month and the cold later will be a little more manageable, but still cool at times. The north northwesterly wind flow aloft that will be responsible for the cold coming into the region will be strong and often from the arctic in the first half of this month, but it will be redirected later in the month reducing the feed of coldest air, but for the 30 days coming up temperatures will be below normal without any question. There will be some more normal days scattered about and few that may briefly rise slightly above normal in a few areas.

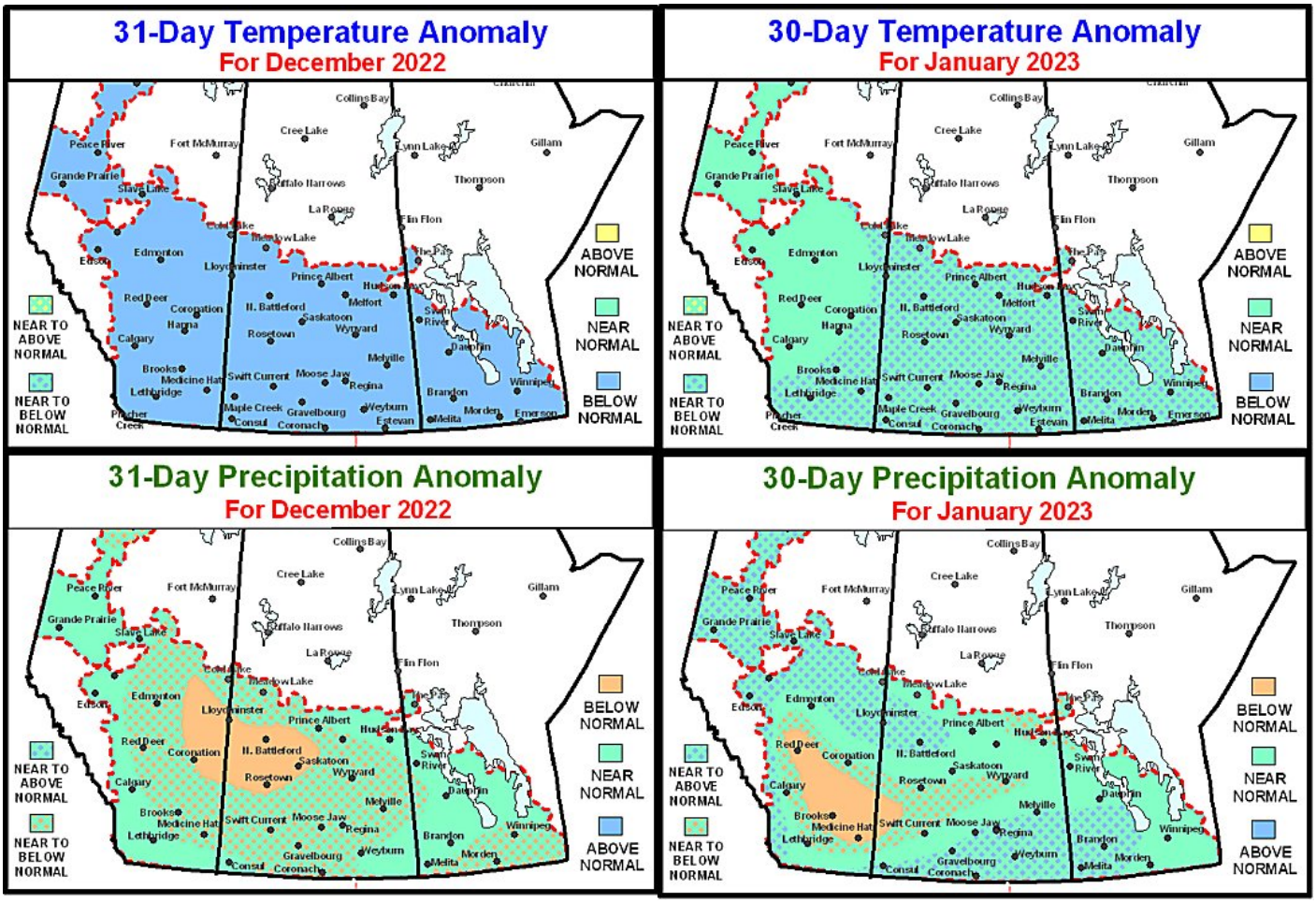
The cool north to northwesterly wind flow across the Prairies will restrict the region from being subjected to large storm systems at least until it starts to warm up. That should leave precipitation during the month near to below average in the majority of the region. With that said, there will be brief periods of snow that will occur like they usually due in these bitter cold air masses and it will be easily blown around.

January temperatures will be a little more normal across the Prairies, but still colder biased at times. Northern and western Alberta will have the best chance of warming up during the month, but because of cool weather at other times the average will be closer to normal than in any other extreme. Temperatures elsewhere in the Prairies will be near to below average, but much less brutally cold than in early December.

Some of the brutal cold will attempt to make come back in late January and early February, though, this time the coldest conditions may shift a little more to the east.

January precipitation will be more varied than that of December with a couple of weather patterns expected during the month. Those patterns will attempt to bring precipitation above normal from the Peace River Region into northwestern Saskatchewan and also from southern Saskatchewan into southern Manitoba. Areas in between these two greater regions of precipitation are likely to see a more limited or restricted precipitation pattern.

Near to below normal January precipitation is expected in the interior southern parts of Alberta along with some east-central parts of the province and farther to the east into central Saskatchewan. Remember that precipitation during winter is normally low and it does not take much to thwart the norms above and below average.



Prairies Drought Relief in Nov. Not Enough (continued from Page 3)

for crop use until frost abates. In the meantime, moisture from the snow melt will run off and be lost as a benefit to the soil and crops.

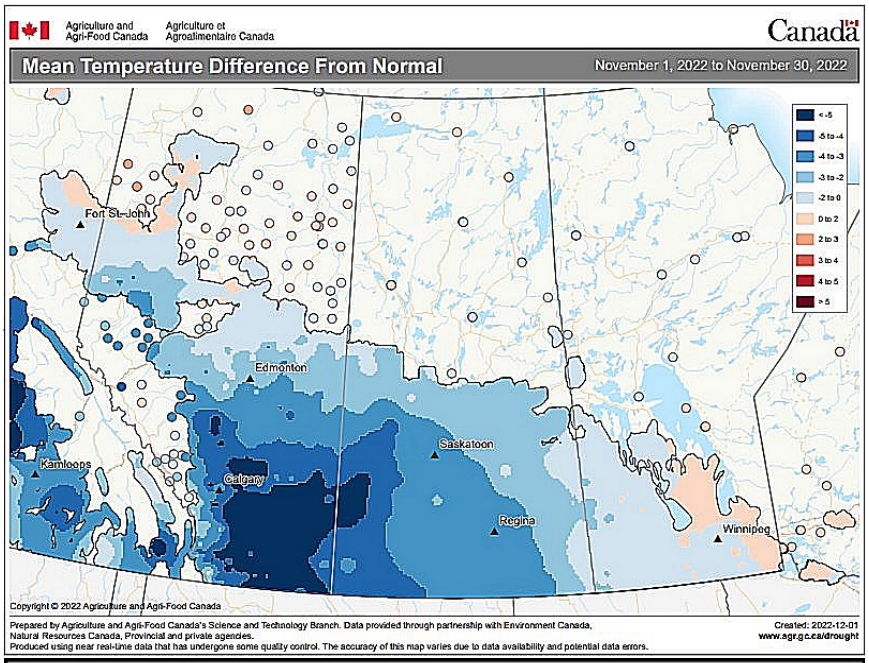
Two waves of arctic air will push across the Prairies through the middle of next week. Disturbances advancing ahead of the cold pools of air will often generate light to moderate amounts of snow. Precipitation will be limited later next week. Moisture totals by next Friday morning will range from trace amounts to 0.25 inch in most locations. New snowfall will range from a dusting to 5 inches with locally greater amounts near the Rockies. Periods of light to moderate snowfall are also expected December 10 – 16.

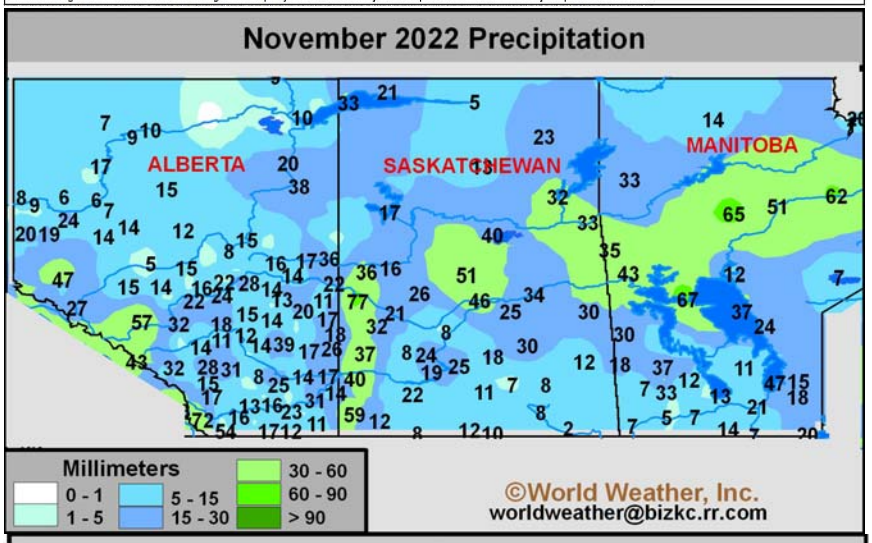
Temperatures will plummet below to well below normal today as the first pool of arctic air advances into the Prairies. Colder or much colder than normal conditions will also evolve Monday into Wednesday. Dangerously low wind chills will be possible with some locations seeing wind chills drop below -40 degrees. The temperature profile will likely moderate closer to normal for brief periods of time between cold surges, but no consistently warm biased weather is likely in this first half of the month.

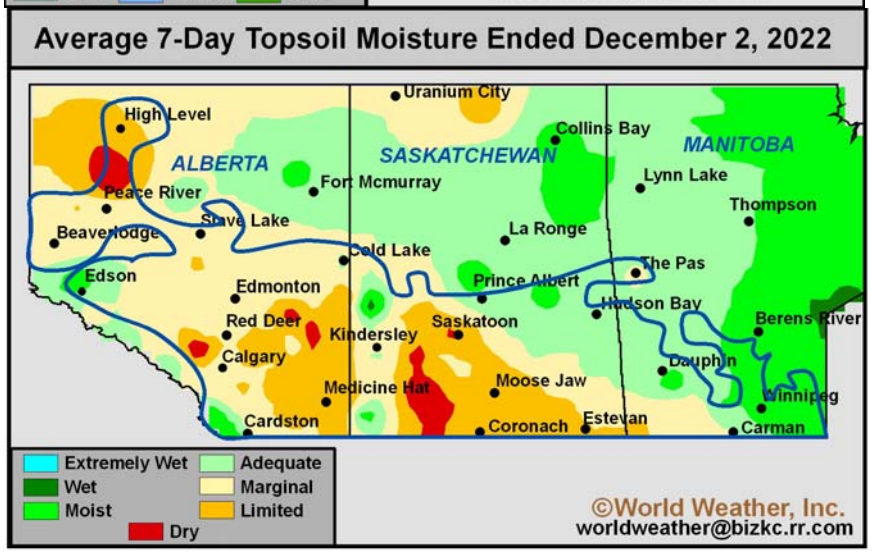
Precipitation during the next two weeks will marginally bolster snowpack in a large section of the Prairies. Resulting moisture content in the snow will be too light to significantly impact long-term soil prospects once the snow melts. The need for snow will remain high in the driest areas of Alberta and Saskatchewan later this winter.

Precipitation during the month of November was greatest in far western and northern portions of Saskatchewan and some western and northern parts of Manitoba where snow depths are greatest. Rain and snow also fell significantly during November in central and southern Alberta and warm temperatures melted much of snow resulting in a boost in topsoil moisture just before the bitter cold arrived.

Spring will prove to be very important for those areas still critically dry. Early spring precipitation may increase followed by drier biased conditions in late spring, but there is much time for change.

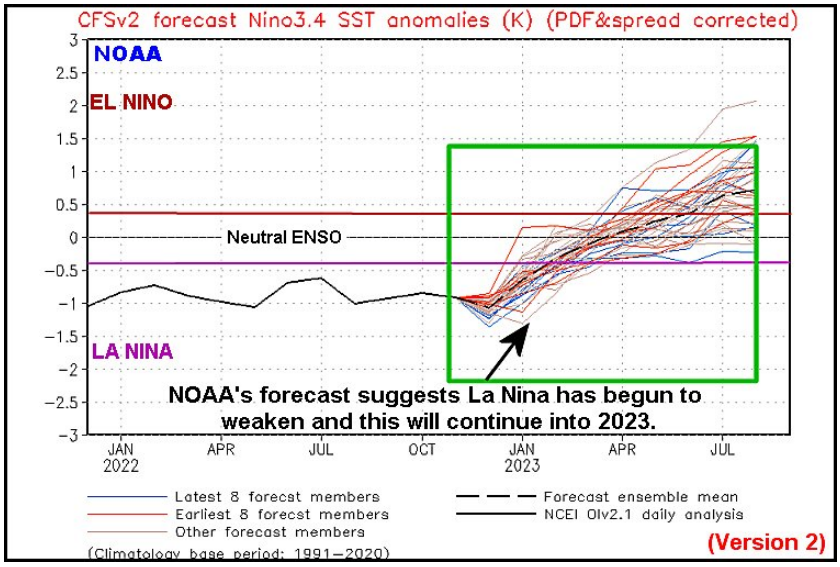






La Nina Weakening Trend Has Begun, Will Accelerate

La Nina has been around since the summer of 2020. It is now in its 29th month of dominance, although for a couple of months in the middle of 2021 it did briefly become a marginal event. The event will continue for another couple of months, but it should be in decline. Some forecasters are talking about its demise in February. By NOAA's definition of La Nina, it will likely last longer than that, but its influence on the world will be greatly diminished in January and February depending on its rate of decline. Weakening La Nina conditions will lead to improved rainfall later this month and especially in January and February in Argentina and relief from drought in the U.S. Plains later this winter and early spring. There will be other implications as well; including a possible warmer finish to winter in the Prairies



La Nina's weakening trend is rather subtle today and one needs to look very hard to find signs of the weakening trend, but they are there. Subsurface ocean temperatures have begun to warm in the eastern equatorial Pacific Ocean and there is big swell in the buildup of warmer than usual ocean water temperatures in the western equatorial Pacific Ocean which tends occur before the warm water starts moving to the east. The graphics below illustrate the warm subsurface water that has been present in the western Pacific Ocean for a very long period of time. By using the International Dateline as a reference point, it is clear that over the past few months the warm water has begun spreading to the east. The warm water from the west and cool water in the east will moderate as the two interact, but over the next few months there should be much less support for cooling water in the eastern equatorial Pacific Ocean than there will be support for warming.

The subsurface ocean water temperature anomalies are usually lifted toward the surface of the ocean in the eastern equatorial Pacific by an upwelling current. Over time, as more warm water from the western Pacific comes into the eastern Pacific, the upwelling current will bring the warmer water toward the surface and this should result in an acceleration in the decline of La Nina.

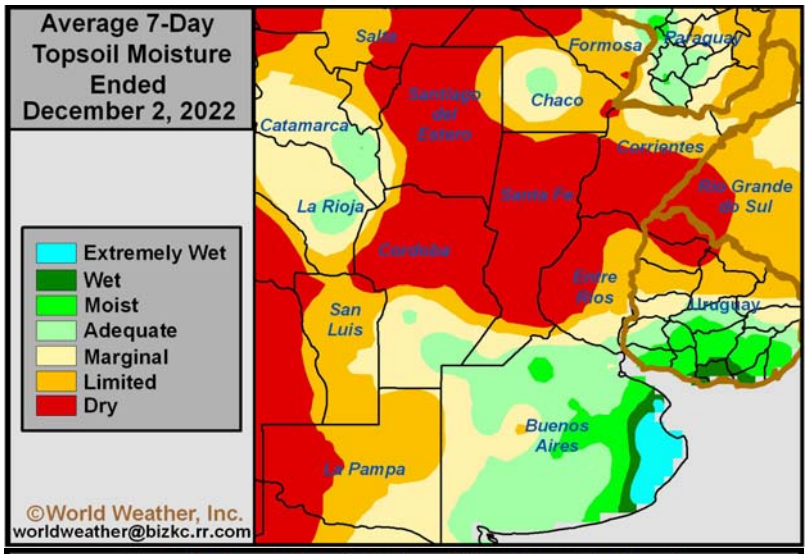
Most computer forecast models for sea surface temperatures in the equatorial Pacific Ocean are showing this warming trend over the next few months. Confidence is high that La Nina will be diminishing in the first quarter of 2023 and the weakening trend in December is likely to continue as well. However, anomalous weather around the world is not likely to show a dramatic change during December.

There will still be some of the traditional biases for La Nina during December; including below average precipitation in eastern Argentina, Uruguay, southern Brazil, southwestern Paraguay, the southern United States and the central U.S. Plains. Wet biases will continue in Southeast Asia, portions of India, Central Africa, Northern South America, Central America, central Brazil, northeastern and east-central Australia and South Africa. The only changes likely in December will be some relaxing in the precipitation anomalies which may allow for some very short-term bouts of rain to impact the drier areas in the world. The wetter areas in the world should encounter less frequent bouts of heavy rain and flood frequency should decrease.

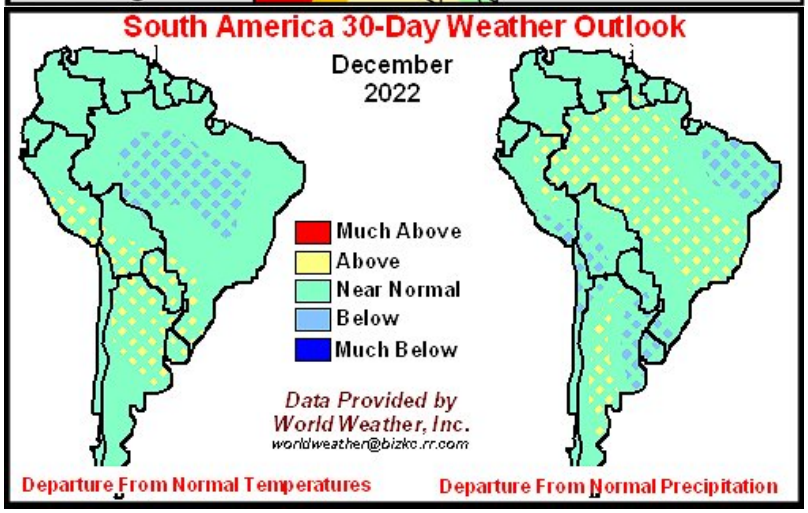
The weakening trend in La Nina is expected to accelerate in January and February and even though NOAA will likely continue La Nina deeper into the first quarter of 2023 the phenomenon will have already lost much of its influence on world weather by February – "if" the model forecasts for its weakening trend are correct. World Weather, Inc. has confidence that the CFSv2 forecast model is on the right track for the demise of La Nina. The model is not reliable out more than 3months and much caution should be made for its prediction of El Nino by July of 2023. That is not likely to verify.

Argentina's Drought To Prevail A While Longer

Rain developed in many important summer grain and oilseed production areas of Argentina from Buenos Aires into southern Cordoba and neighboring areas of San Luis and southern Santa Fe earlier this past week. The precipitation brought some relief to the previous week of very warm to hot temperatures and mostly dry conditions; however, the relief was temporary with more warm and dry weather expected through much of next week. Soil conditions will quickly firm again with the earliest opportunity for any rain nearly a full week away.



One of Argentina's primary summer crop production areas runs from southern Cordoba to central Buenos Aires and a part of that region received 0.35 to 1.50 inches of rain this week with a local report of as much as 2.42 inches in southeastern Cordoba. The moisture eased dryness, but did not seriously change drought status. Now the same region will be dry and very warm to hot for another seven days making it 10 days between rain events. That is not enough to fix drought.



That rain event coupled with one that occurred earlier in November has left the topsoil in fair condition for some summer crop planting and for improved early season crop establishment and growth in the south. However, another week of temperatures in the 30s and lower 40s Celsius without rain will quickly deplete topsoil moisture leading to more crop stress and more production concern .

Wheat production has already been slashed and recent rain came too late to change the bottom line. Early corn and sunseed development has also been seriously harmed and yields will be down. Some of the early season crops were not planted and late season crops including late corn, soybeans, sorghum and cotton have been delayed in being planted because of drought. The most serious dryness has been and continues to be in central and northern parts of the nation where some areas have received less than 0.50 inch of rain for more than 30 days.

Argentina's drought is quite serious and is being seriously influenced by La Nina which normally leaves eastern parts of the nation with a drier bias while western areas see improved rainfall during December. Now that La Nina has begun to weaken, December is likely to be the last month of significant influence from La Nina. World Weather, Inc. believes the month of precipitation will slowly become more La Nina traditional with improved rainfall in the west and north while the east-central and southeastern areas in the nation remain drier than usual. Temperatures in December are also expected to be warmer than usual.

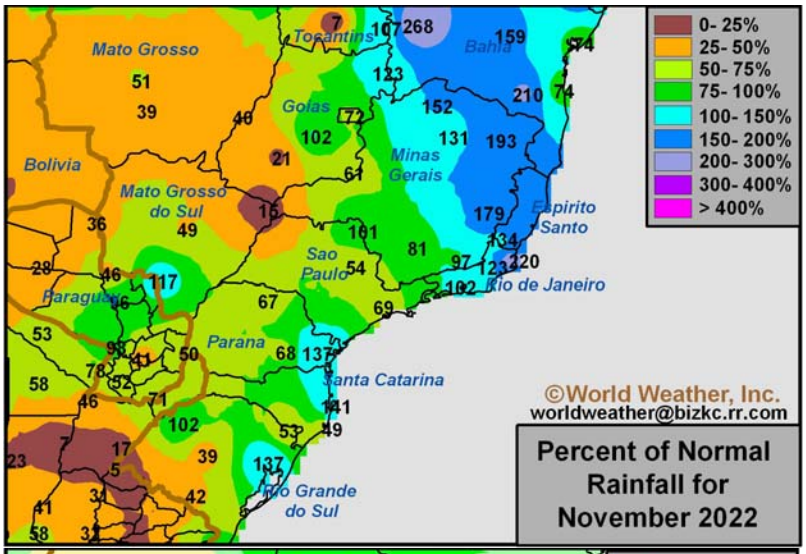
The longer range outlook for Argentina is for normal to above normal rainfall to occur in January and February with more normal temperatures. If the change occurs as expected late season crops will experience improvement, but early season crops will still suffer losses. Production will be mostly determined by when the greater rain arrives and that is not very likely for a while.

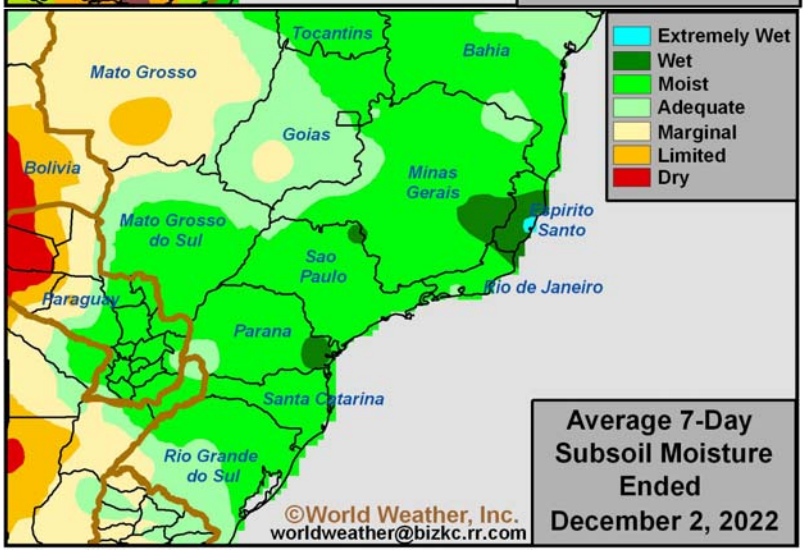
Western, Southern Brazil Rainfall Less Than Usual

Brazil rainfall has been lighter than usual during much of the spring season this year in western and southern parts of the nation. In particular, Mato Grosso, southwestern Goias, Bolivia, northern Mato Grosso do Sul, western Sao Paulo and northern Paraguay have all reported notably lighter than usual rainfall in the month of November. Much of the region described has received less than half of normal precipitation.

Soil moisture is lighter than usual, but it has not been so dry that crops are failing. For most of November the rain distribution was sufficient to support good crop development in most of Brazil, despite the drier tendency in the west and south. However, at the end of the month topsoil moisture excessively great in the northeast and east-central parts of the nation and running short to very short in portions of the west and far south.

Despite the drier finish to November, most of Rio Grande do Sul, Mato Grosso do Sul, western Parana and Paraguay had good soil moisture for much of the month because of wetter than usual conditions in October and early November. The only part of Brazil that has had ongoing dryness in the soil has been in portions of southern Mato Grosso and fro brief periods of time both Bolivia and southwestern Goias. A little crop stress may be present in the driest region, but rain is supposed to evolve in this coming week and continue into late Month that should prevent the moisture stress from becoming a threat to production.





Temperatures have also been a big factor to Brazil crop conditions so far this growing season. Frequent cooler than usual conditions occurred in October and early November which conserved soil moisture on the drier days and helped many crop areas deal with the lighter rainfall bias without much of an issue.

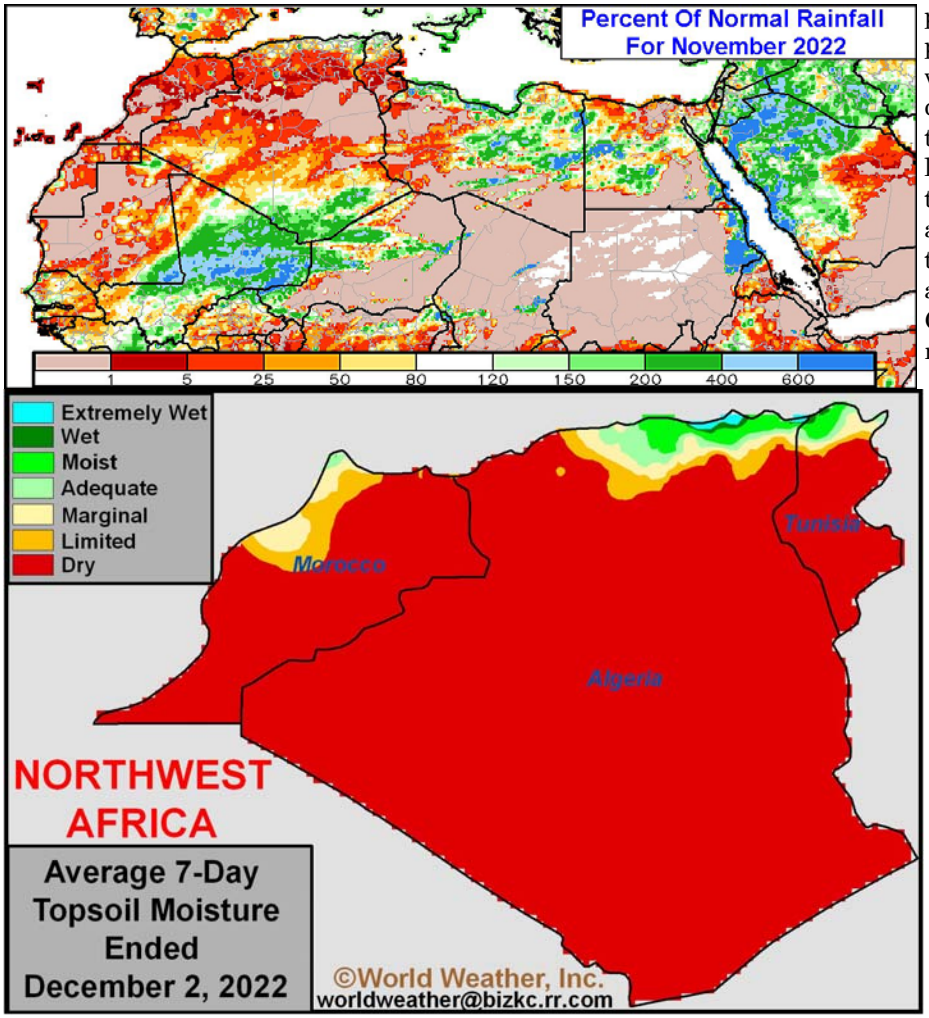
Rain in eastern parts of Brazil's summer grain and oilseed production region has been abundant. The month of November ended with well above average precipitation with moisture totals varying from one to two times' normal. No flooding of significance had occurred through the end of November, but the stage is being set for that as a possibility if there is not some drier weather in December.

December weather is expected to be a little drier than usual in Rio Grande do Sul, parts of Paraguay and in neighboring areas, but the dryness is not expected to be very dramatic. Some timely rain is expected, though, the topsoil will be drier biased at times. Most other center west and center south crop areas will get timely rainfall and experience seasonable temperatures will support normal crop development. that should translate into high yielding crops.

It is very important to note that "normal" rain in center west Brazil is usually too much for ideal crop development and in years like this one in which rainfall is routine, but lighter than usual then end result is often high yields and good production.

North Africa Needs More Rain For Durum Wheat

Morocco and northwestern Algeria remain critically dry due to the lack of precipitation during the past month. The multi-year drought is continuing in much of Morocco and abundant rainfall is needed to fix the dryness. North-central Algeria has marginally adequate to short soil moisture. Northern Tunisia and northeastern Algeria otherwise have marginally adequate to adequate amounts of moisture in the topsoil while still lacking moisture further down in the ground.



Winter wheat and barley prospects remain poor for southwestern Morocco. The ground remains critically dry and reservoir levels remain well below historical levels. Even with periods of rain in the coming weeks, production will likely again be below normal this season due to the ongoing drought. Multi-year drought. Wheat and barley prospects are more favorable in Tunisia and Algeria, where timely rain has occurred in recent weeks. Periods of rain would still be welcome in the coming weeks, most notably in northwestern Algeria where moisture shortages are most prevalent. in recent weeks. Periods of rain would still be welcome in the coming weeks, most notably in northwestern Algeria where moisture shortages are most prevalent.

Alternating periods of erratic rain and sunshine are slated for Morocco through the end of next week. A series of disturbances from the Atlantic Ocean will promote showers for the country through Monday and again later next week. Moisture totals by next Friday morning will range from 0.10 to 0.75 inch with local amounts over 1.00 inch in north-central Morocco. Algeria and Tunisia will occasionally receive light rain, though resulting rainfall will be lost to evaporation. There is potential for more widespread rain December

10 – 16 as colder air builds over Western Europe.

Rainfall through the end of next week in Morocco will be too light to significantly improve the moisture profile. Winter wheat and barley development conditions will remain less than favorable to poor, even in areas that receive the greatest amount of rain. Crop conditions may marginally improve toward mid-December if the wetter weather verifies. However, most locations will still need more rain to support more favorable long-term crop prospects.

Algeria and Tunisia will slowly dry down through the end of next week. Northwestern Algeria will be too dry for ideal crop conditions and would benefit from more rain. Northern Tunisia and the remaining locations in northern Algeria will have some moisture to support new growth despite the drying trend. With more widespread rain possible during the second week of the outlook, winter wheat and barley prospects will remain mostly favorable.