Drought Report for the Agricultural Region of Alberta
September 20, 2009

Summary

Since the last drought report, on August 20, 2009, dry conditions have returned to many parts of the province, particularly south of the City of Edmonton stretching east to west across the province and down to the US border. In contrast, the northern parts of the Peace Region and the central and northwestern portion of the Northern Region received near normal amounts precipitation (80 to 120 percent of normal). As a consequence of below normal precipitation accumulations over the past growing season, soil moisture reserves are classified as being at least low with large parts of the Central, Northern and Peace Regions classified as having extremely low soil moisture reserves. The dry and hot weather provided good weather for harvesting, but has adversely affected pasture and hay crops.

Average daily mean temperatures relative to long term normal, during the past 15-days, were extremely high in the Peace and Northern Regions, as well as along the eastern border of the Central and Southern Regions (Figure 7). Elsewhere, average temperatures generally varied from high to very high. The hot, dry weather continues to reduce soil moisture reserves, when at this time of year they typically begin to increase. Fall precipitation is needed to replenish soil moisture reserves prior to freeze up.

Growing season (April 1, 2009 to Sept 20, 2009) precipitation accumulations relative to long term normal, to date, ranged from moderately low to near normal across the Southern Region and parts of the Central Region. In contrast, across the rest of the reporting area, accumulations relative to long term normal graded down from moderately low and low to very low and extremely low. The driest areas in the agricultural regions were located in the southern , central and northcentral portions of the Northern Region and southwestern and northeastern portion of the Central Region (Figure 2 and 3).

Modeled soil moisture reserves, relative to long term normal (Figure 6), varied from the very low to extremely low across the Northern Region, most parts of the Central Region, the southern parts of the Peace Region, and in few scattered pockets in the Southern Region. Reserves in the rest of the reporting area varied from moderately low to low with the exception of few isolated pockets with near normal reserves. Current modeled soil moisture reserves across most parts of the reporting area have fallen below 25 mm.

A large selection of related maps can be found at http://www.agric.gov.ab.ca/acis, under the Quick Viewer tab. Note these maps are updated once a week (usually by Wednesday) providing updates between drought reports.

Precipitation

Precipitation since the August 17, 2009 Drought Report (Figure 1)

Since the last report, August 17, 2009, most parts of the Peace Region and the northwestern and the central portions of the Northern Region recorded near normal amount of precipitation, ranging between 20 to 80 mm while much of the rest of the reporting area received precipitation less than 10 mm.

Peace Region: Precipitation accumulations graded down from a high of 60 to 80 mm range in the north to less than 20 mm in the south. Precipitation accumulations were the greatest at Fort Vermillion RS (75.8 mm), followed by La Crete AGCM station (60.1mm), both located in the north, while the lowest accumulations were recorded at Teepee Creek AGCM station (15.8 mm), followed by Beaverlodge RSC station (16.9 mm), both located in the southwestern parts of the region.

Northern Region: Precipitation accumulations graded from a high of 70 to 80 mm range in the northwest to less than 10 mm in the southern and southeastern portion of the region, with the exception of a pocket in the center with 40 to 50 mm range. The highest precipitation in the region was recorded at Athabasca AGCM station (81.24 mm), followed by Fort Assiniboine AGCM station (75.4 mm) both in the northwest. The lowest amounts of less than 2 mm were recorded at the Forestburg, Bellshill and Hughenden AGCM stations in the southeast.

Central Region: Precipitation totals were less than 10 mm across most of the region with the exception of portions in the western and eastern parts of the region in the 10 to 20 mm range. Six stations scattered across the region recoded precipitation totals less than 2 mm.

Southern Region: Precipitation totals were generally less than 20 mm across much of the region, with many locations receiving less than 10 mm. Precipitation accumulations were the greatest at Pekisko station(31.5 mm) in the west, followed by Medicine Lodge station (21.5mm) located in the east, while the lowest accumulations were recorded at Brooks ASCHRC station (2.9 mm) located in northeast followed by Claresholm station (3.7 mm), located in the western part of the region.

Growing Season Precipitation Accumulations, April 1 to September 20, 2009 (Figure 2 and 3)

To date, growing season precipitation accumulations relative long term normal are very low to extremely low across much of the Northern Region (125 to 200 mm), the western and northeastern part of the Central region (125 to 200 mm) and the central, eastern and southeastern portion of the Peace Region (125 to 175). Accumulations, relative to long term normal, across the rest of the reporting area, varied from low (175 to 200 mm) to near normal and very high (225 to 400 mm).

Peace Region: Growing season accumulations relative to long term normal ranged from moderately low to low (175 to 225 mm) in the northern and western portion, to very low (125 to 175 mm) in the central and southeastern portions of the region.

Northern Region: Growing season precipitation relative to long term normal across much of the region varied from extremely low to very low (125 to 200 mm), grading up to low and moderately low (200 to 300 mm) mainly in the western and eastern parts of the region. In general, growing season totals are the lowest, 25 to 50 percent of normal, in southwestern, central and central north part of the region and 50 to 80 percent of normal across the rest of the region.

Central Region: Growing season precipitation relative to long term normal in the western and the northeastern portions the region varied from extremely low to very low (125 to 200 mm) grading up to low (200 to 250 mm) in the central and along the southern border of the region. The growing season totals for most parts of the region was 50 to 80 percent of normal with the exception of pockets in the west with, 25 to 50 percent of normal and along the southeastern border 80 to 120 percent of normal.

Southern Region: Growing season precipitation relative to long term normal across the region ranged from a high of near normal to very high (225 to 400 mm) down to moderately low to low (150 to 200 mm). Growing season totals as percentage of the normal varied from 80 to 120 percent across most parts of the region down to 50 to 80 percent of normal across the rest of the region.

Average Precipitation Accumulations for September (Figure 4)
September marks the transition between the wet season (May - August) and the drier winter months (October - March). During this month precipitation typically declines significantly, with precipitation totals ranging from just over 20 mm in the Special Areas to less than 60 mm in the Swan Hills and Foothills. Provincially, on average about 9 percent of the annual precipitation falls in September. September and October are important months for soil moisture recharge in Alberta, since moisture losses due to evaporation and plant water demands are reduced significantly. Fall and spring rains help to replenish soil moisture for the following growing season, thus those areas that are currently abnormally dry will need above average precipitation over the next several months to help build soil moisture reserves for next spring.

Soil moisture in the agricultural regions of Alberta (Figure 5 and Figure 6)
Modeled soil moisture reserves relative to long term normal, varied from very low to extremely low across much of the Northern Region, parts of the Peace and Central Regions as well as several pockets in the Southern Region. Elsewhere, reserves generally varied from moderately low to low with the exception of few isolated pockets with near normal reserves. In general, current modeled soil moisture reserves across most parts of the reporting area have fallen below 25 mm due to the much below normal precipitation received in the months of April, May, June, August and September.

Peace Region: Modeled soil moisture levels were less than 25 mm across most of the region with the exception in the northern corner with reserves in the 25 to 50 mm range. Soil moisture reserves, relative to long term normal, where extremely low to very low in the south, and generally low to moderately elsewhere.

Northern Region: Modeled soil moisture levels across most of the region were less than 25 mm. Relative to long term normal, soil moisture reserves across most parts of the region are classified as extremely low to very low, with only a few exceptions.

Central Region: Modeled soil moisture levels across most of the region were less than 25 mm with the exception of areas along the extreme western boarder where reserves were in 50 to 75 mm range. Relative to long term normal, soil moisture reserves across most parts of the region were extremely low to low, with the exception of two pockets in the southeast, where reserves varied from moderately low to near normal.

Southern Region: Relative to long term normal, soil moisture reserves across most of the region varied from moderately low to low with the exception of few isolated pockets of near normal along the foot hills and in the cypress hills and some larger areas grading to very low to extremely low.. Modeled soil moisture levels across most parts of the region were less than 25 mm with the exception of areas along the foothills where reserves were in 50 to 75 mm range.

Data Sources:

Near Real Time Weather data

Daily and hourly near-real-time raw weather data is brought in via daily data feeds from Alberta Environment (AENV) and Environment Canada (EC). The data undergoes a preliminary computer assisted QA/QC check performed by Alberta Agriculture and Rural Development (ARD) staff. Suspicious values are checked and verified and daily missing values are filled using archived data from AENV databases or from the EC web site. If daily data is still missing, it is estimated using data from nearby stations. Maps describing current conditions are based on preliminary data that is subject to change under further review by ARD, AENV and EC.

Historical Weather data

Historical weather data was provided by Environment Canada. This data was then converted to a 10 km daily gridded weather data set that used all available daily data to generate historical climate and soil moisture normal.

Explanation of Terms

Precipitation Accumulation - Frequency of Occurrence

Precipitation accumulation, expressed as a frequency of occurrence are computed for various periods and can be found on our web site at www.agric.gov.ab.ca\acis, under the Quick Viewer tab. Maps are routinely produced for the following periods:

- Past 365-days
- Past 180-days,
- Past 90-days
- Past 30-days,
- Growing season to date –Starting April 1
- Cold Season to date- Starting October 1

Selected maps from this series are included in this report.

Precipitation accumulation for each period is then determined by ranking the precipitation accumulation during similar period dating back from 1961 to present. The current accumulation is compared to the ranked values, yielding the frequency of occurrence, based on percentiles. The percentile points were then put into arbitrary but intuitive classification fields that describe the current state as drier, near or wetter than the long term

normal. The resulting map thus answers the question "how often does this occur?" The classifications are as follows:

Extremely low.....drier than this, on average, less than 1 once in 25-years
very low.....drier than this, on average, less than 1 once in 12-years
low.....drier than this, on average, less than 1 once in 6-years
moderately low.....drier than this, on average, less than 1 once in 3-years
near normal.....on average, this occurs at least 1 in 3-years
moderately high .....wetter than this, on average, less than 1 once in 3-years
high .....wetter than this, on average, less than 1 once in 6-years
very high.....wetter than this, on average, less than 1 once in 12-years
extremely high..... wetter than this, on average, less than 1 once in 25-years

This same scheme is then used for similar maps of soil moisture and snow pack accumulation so that comparisons can readily be made across the various map types.

Snow pack (reported during the winter season only)
Snow pack snow water equivalents (SWE) are modeled for stubble fields. SWE is defined as the equivalent depth of water (mm) that the snow pack contains if it were to be melted. SWE is computed from precipitation and subsequent losses due to blowing, sublimation and snow melt processes.

In the model, if precipitation falls when the mean daily temperature is below 2 °C that precipitation is estimated to be in the form of snow. If precipitation if estimated to fall as snow then to simulate drifting, only 70 percent of the total precipitation is allowed to accumulate resulting in a 30 percent loss due to snow "blow off". If precipitation occurs as rain on an existing snow pack, it is added directly to the snow pack as SWE.

Soil moisture (reported during the growing season months only)
Soil moisture is measured as millimeters (mm) of plant available water. Plant available water is approximately half of the total water that can be measured in the soil. Soil moisture is reported on from May through to October.

The crop gets the moisture it requires from the reserve of soil moisture, which in turn is replenished by precipitation. Soil moisture is a valuable indicator of drought potential because it indicates the reserve of water available to the crop at a given point in time. During peak growing periods, soil moisture reserves are consumed quickly and must be replenished frequently by rainfall. Poor soil moisture reserves during peak water use indicate a *high* risk of immediate crop stress. Prolonged stress becomes drought and results in significant unrecoverable yield loss.

Because the climate varies across Alberta, comparing current moisture levels to normal levels provides a valuable indicator of drought risk that can be applied to all localities during the frost-free season. Current soil moisture levels are compared against soil moisture levels for the same day in each year from 1961 to present. The frequency of occurrence is computed based on the percentile points, using the same method that was used for similar maps that were generated for precipitation. The frequency of occurrence is then plotted using the same class scheme as is used in the long-term (hydrologic) drought

map (see table above). Soil moisture reserves with a modifier of *low*, indicate a need for more precipitation to restore reserves.

Soil moisture needed to return to average spring or fall conditions

Soil moisture needed to return to normal spring or fall conditions is computed by subtracting average soil moisture (spring or fall), computed using model runs dating back from 1961 from current soil moisture conditions. This yields the amount of recharge needed to bring current soil moisture levels to average. Historic model runs are then analyzed to determine how many years since 1961 that soil moisture recharge was similar to or greater than that currently needed. The number of years that this occurred is then used to compute the probability of returning to average. However, currently this process is unable to account for snow currently existing on the ground and as such is not as accurate where snow packs exist.

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This report was created on September 20, 2009.

Drought analysis is currently scheduled at monthly intervals. This report updates the previous report of Aug 17, 2009.

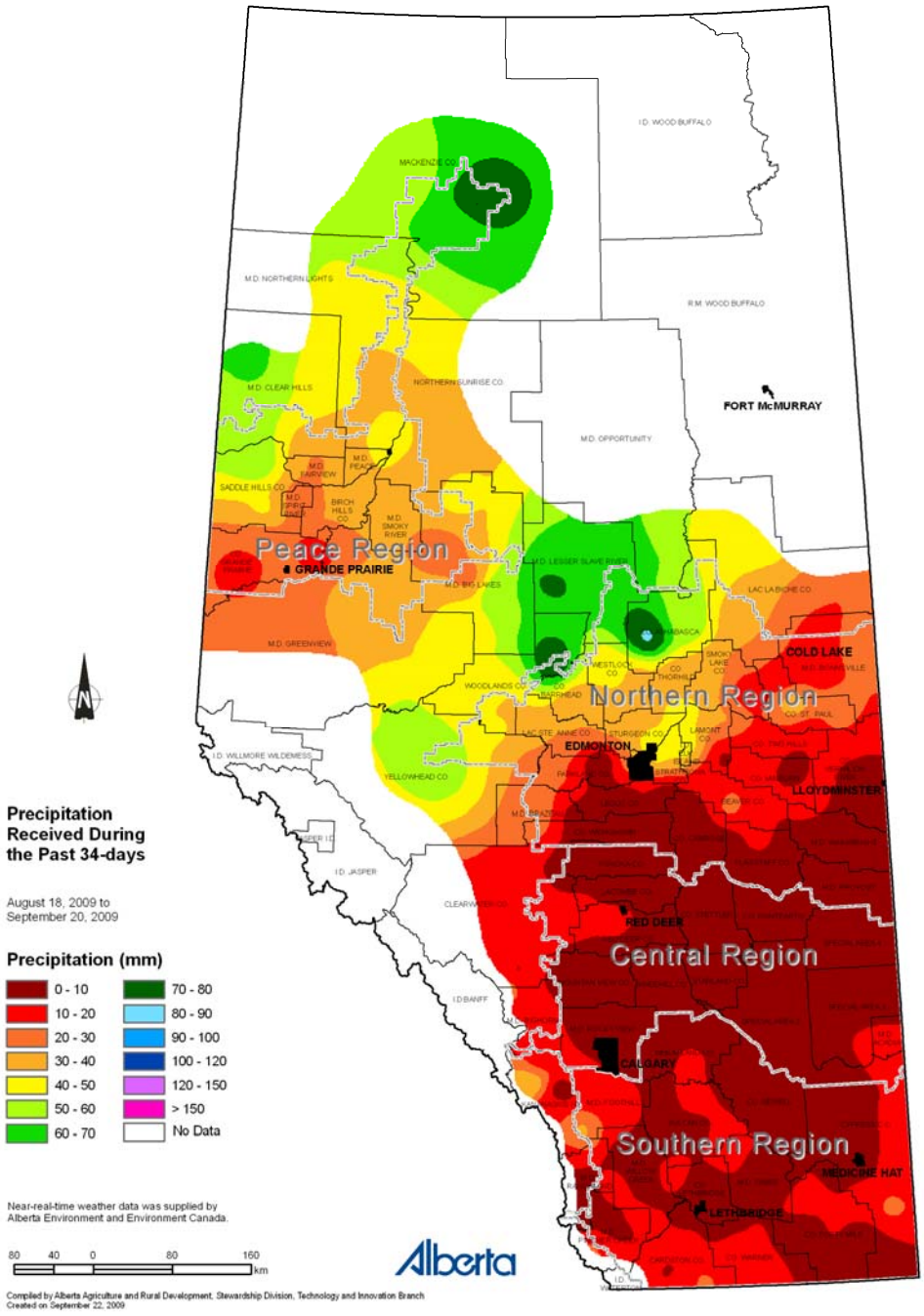

Figure 1. Precipitation (mm) received since the August 17 2009 Drought Report, as of September 20, 2009.

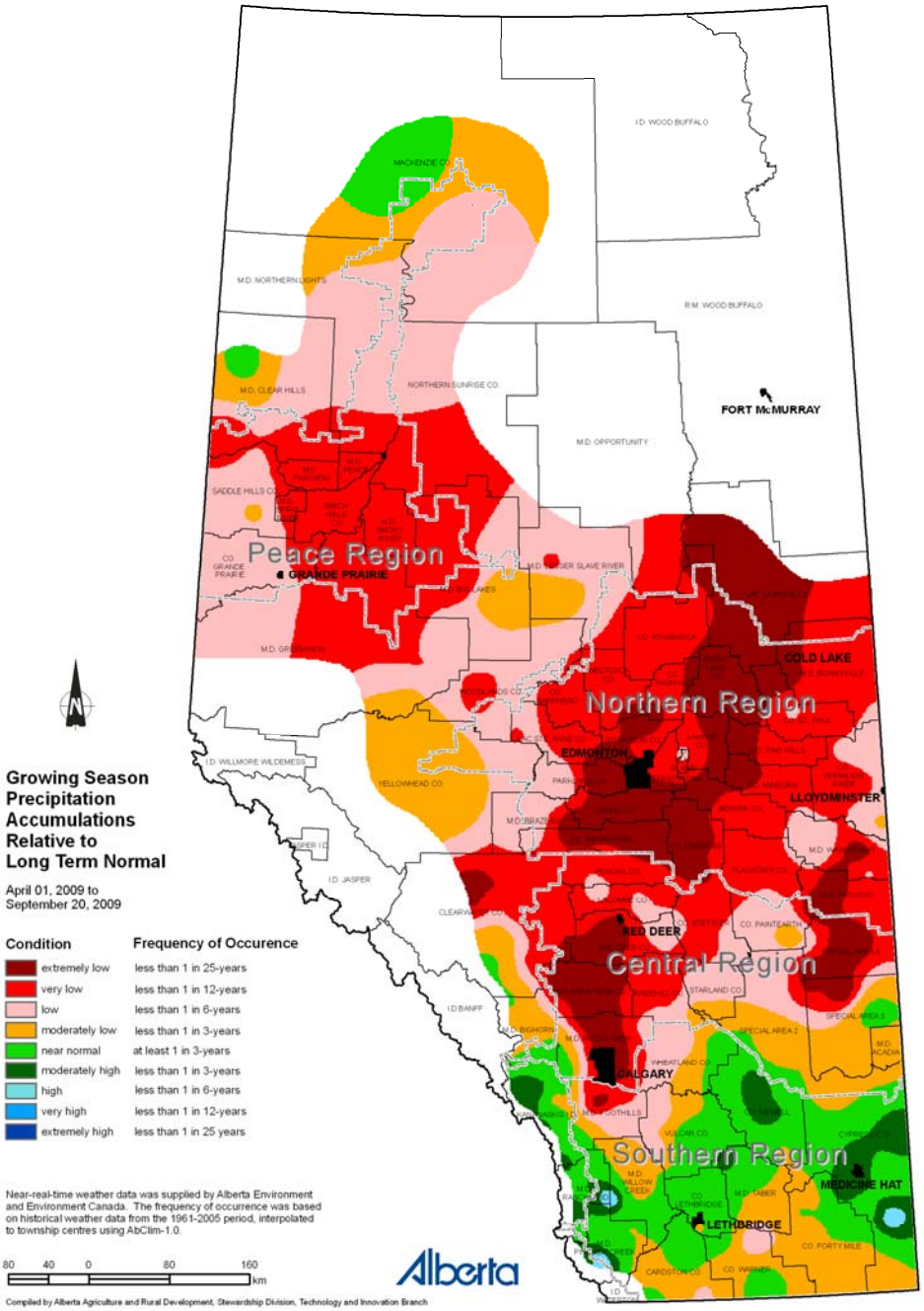

Figure 2. Growing Season precipitation accumulations to date, relative to long term normal, as of September 20, 2009.

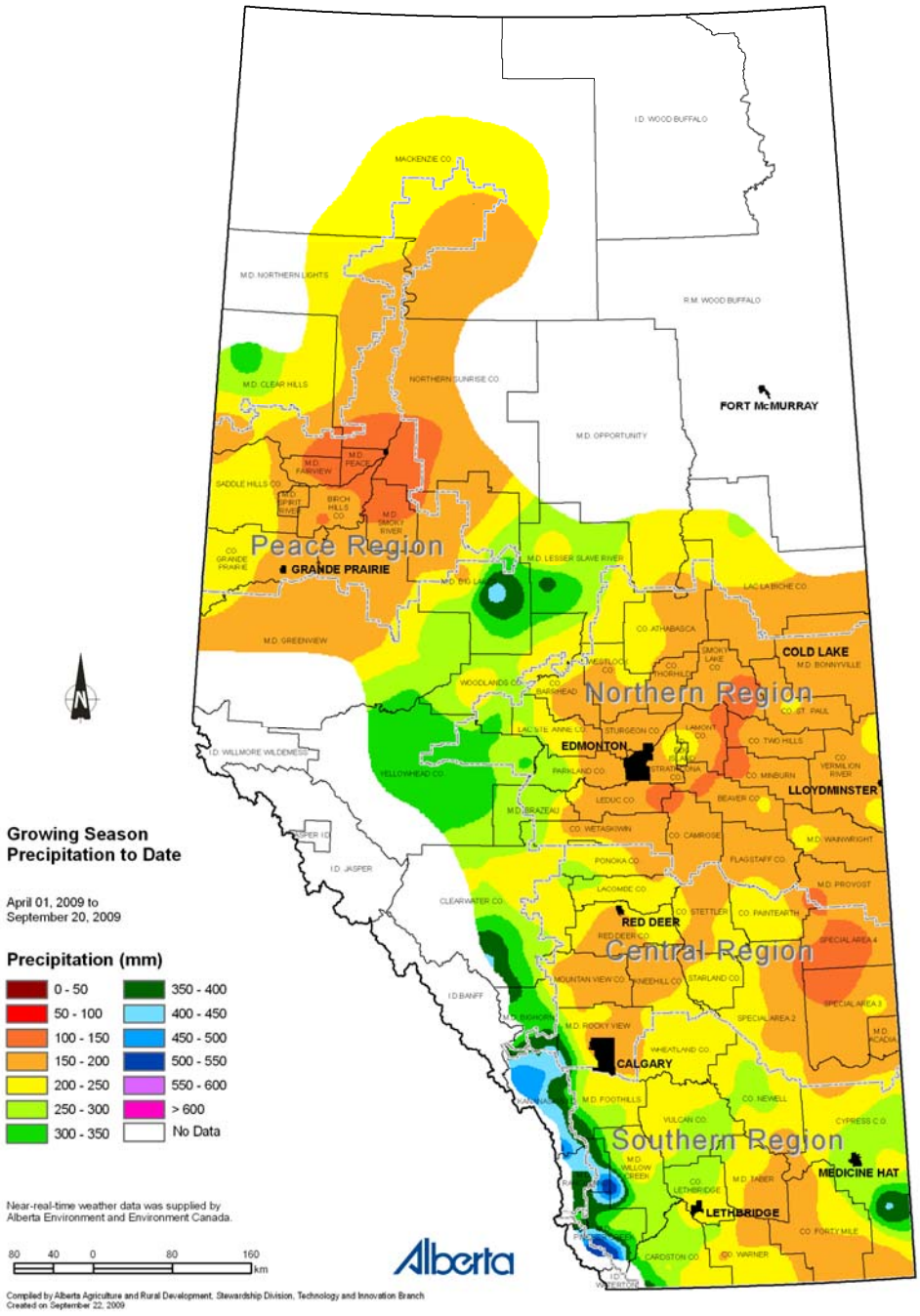

Figure 3. Growing Season precipitation accumulations to date as of September 20, 2009.

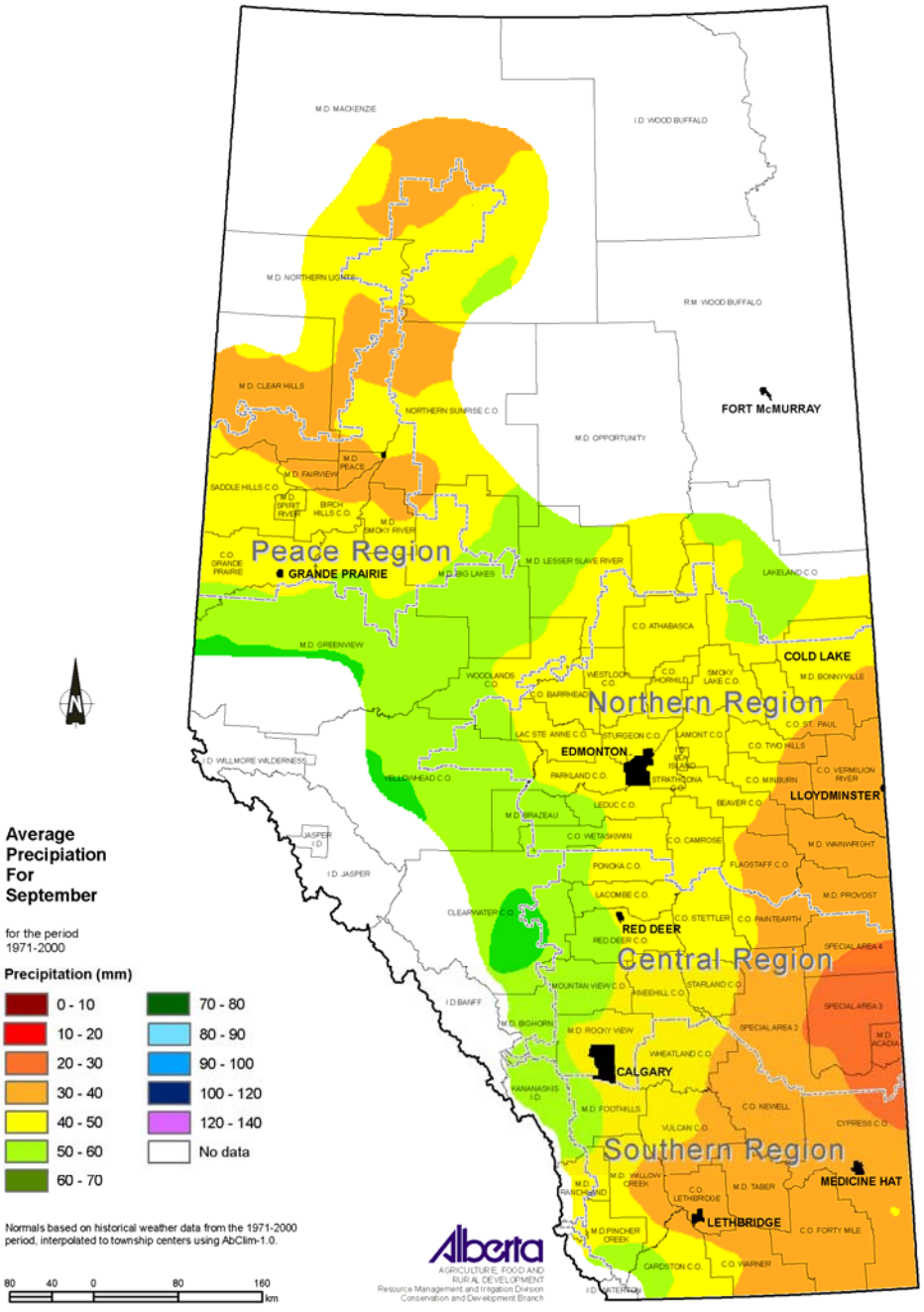

Figure 4. Average (1971-2000) precipitation for September.

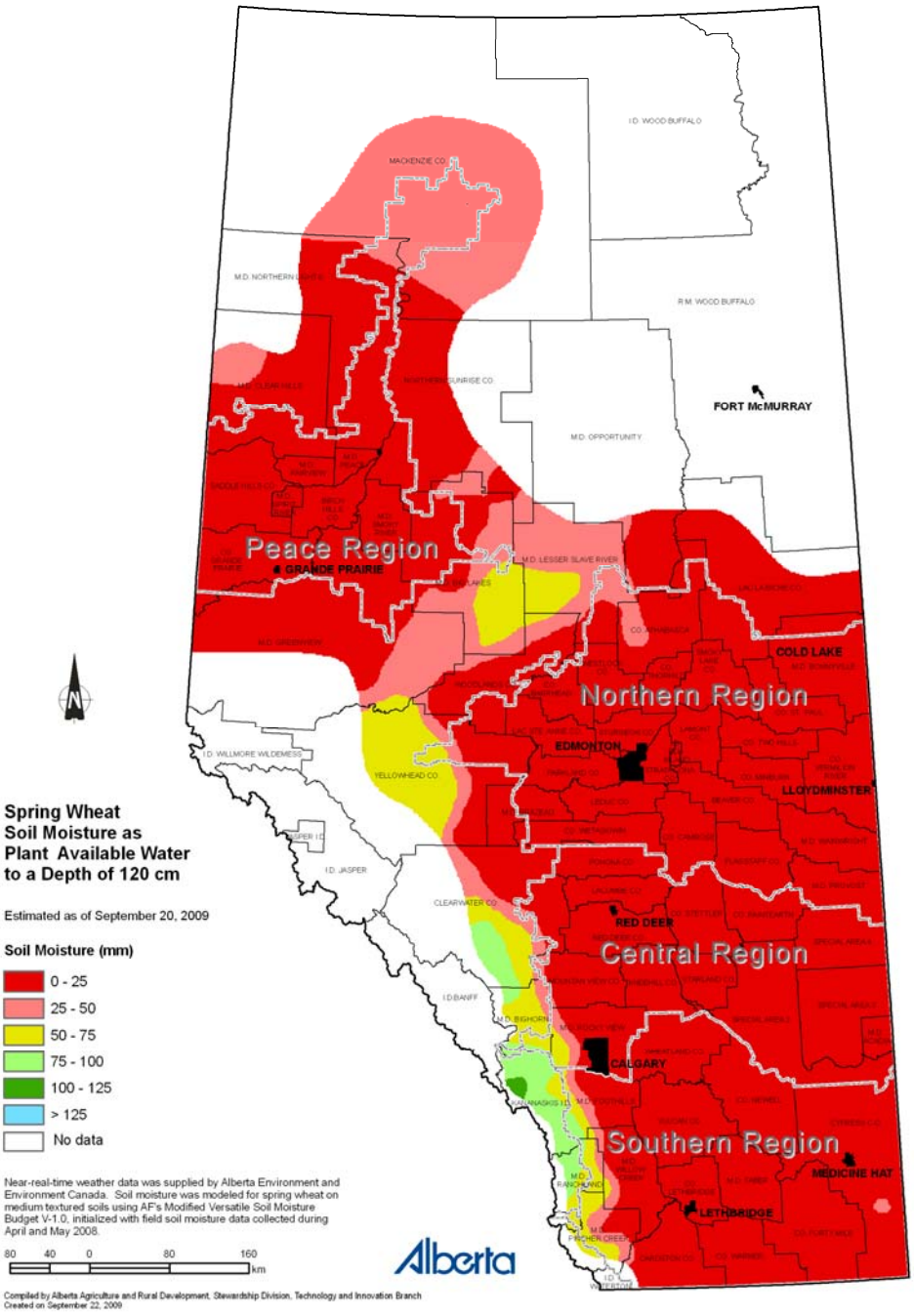

Figure 5. Modeled soil moisture in the agricultural region of Alberta as of September 20, 2009.

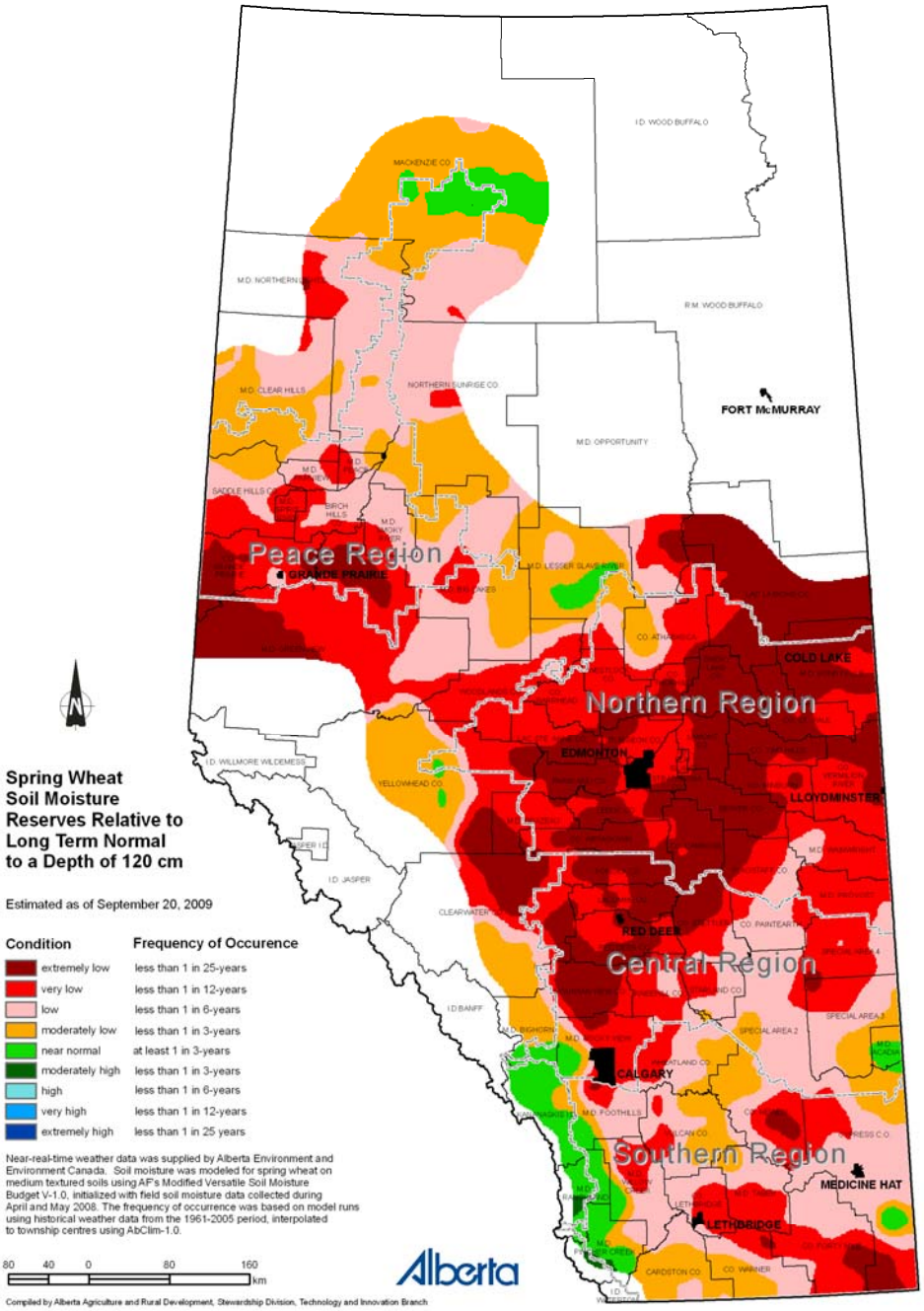

Figure 6. Soil moisture reserves relative to long term normal soil moisture conditions for September 20, 2009**.**

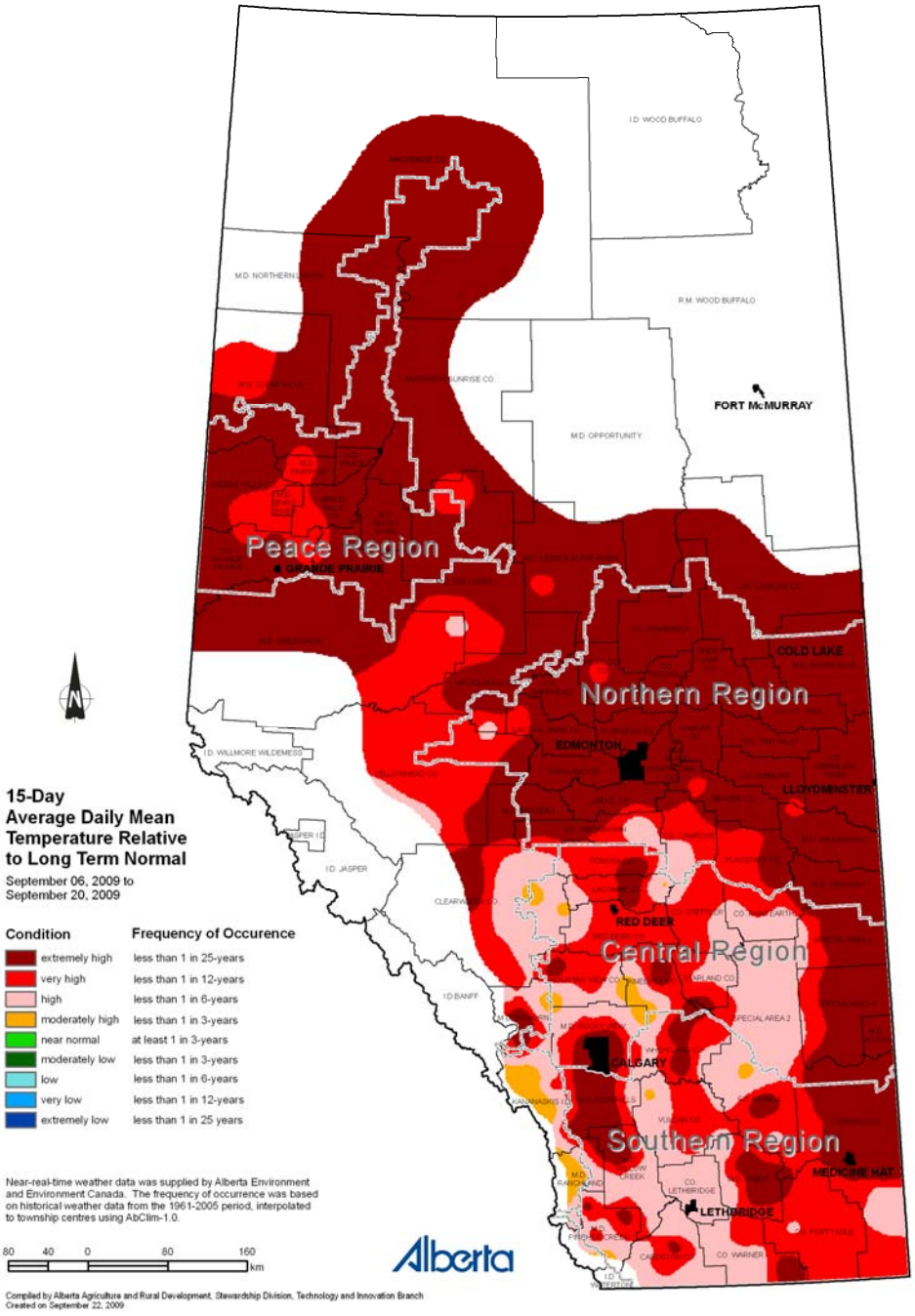

Figure 7. 15-day average daily mean temperature trend, relative to long term normal, prior to September 20, 2009.